

Early Predictors of Variations in Children's Emotion Understanding: Relations
With Children's Disruptive Behaviors

by

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ABSTRACT

The purpose of this study was to examine the longitudinal relations of maternal behaviors, children's temperamental negative emotionality, and children's emotion perception processes, including emotion perception accuracy (EPA) and emotion perception bias (EPB), to children's conduct disorder symptoms in a normative sample. Separate structural equation models were conducted to assess whether parenting or children's proneness to negative emotions at 24-30 (T2), 36-42 (T3) and 48-54 (T4) months predicted children's EPA and EPB over time, and whether T3 and T4 children's emotion perception processes were predictive of children's conduct disorder at 72 months of age (T5). None of the hypothesized longitudinal relations was supported; however, other noteworthy results were observed. T3 children's proneness to negative emotions was positively related to children's concurrent bias toward anger. The latent constructs of negative parenting, children's proneness to negative emotions, and the observed measure of children's emotion perception accuracy showed stability over time, whereas the observed measures of children's bias toward understanding distinct negative emotions were unrelated across time. In addition, children's expressive language was predicted by children's earlier emotion perception accuracy, which emphasized the importance of improving children's emotion understanding skills during early years. Furthermore, the previously established negative relation between EPA and EPB variables was only partially supported. Findings regarding the relations between parenting, children's negative emotionality and emotion perception processes are discussed from a developmental perspective.

To my parents, Jaffar and Razieh, who never gave up on me

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Introduction

Emotion understanding or emotion knowledge refers to one's ability to identify and recognize different emotions and to understand the causes and consequences of each emotion (Denham, 1998; Thompson, 1987; Thompson, Laible, & Ontai, 2003). In daily interactions, individuals utilize emotion understanding skills to apprehend their partners' motivations and behaviors, and their reactions to others likely depends on whether they accurately identify and interpret others' emotional expressions and reactions. Thus, children's emotion understanding has been related to positive outcomes including higher social competence, prosocial behaviors, peer acceptance and likability, quality of relationships with teachers in preschool and kindergarten (Denham, 1986; Denham et al., 2003; Garner, Jones, & Miner, 1994; Pons, Lawson, Harris, & deRosnay, 2003), and better academic achievement and school adjustment in elementary school (Izard et al., 2001).

It is important to note that emotion understanding often has been measured globally, using an aggregate score that reflects children's accurate identification of emotional expressions. In this type of assessment, children are asked to label emotions (from pictures or puppets) and then are presented with several hypothetical vignettes and asked how the protagonist would feel in each situation. However, Fine, Trentacosta, Izard, Mostow, and Campebell (2004) postulated that it is important to examine how children's perceptions of each differentiated emotion predict behavioral outcomes and adjustment. Furthermore, these researchers highlighted the importance of differentiating between emotion

perception accuracy and emotion perception bias in predicting outcomes. Emotion perception accuracy is defined as the accurate identification of distinct emotions, whereas emotion perception bias is the consistent misidentification of an emotion as another. For instance, a child with high anger perception accuracy has the ability to correctly identify expressed anger, and a child high in anger perception bias would be inclined to incorrectly identify other expressed emotions, such as sadness or fear, as anger.

Although not always consistent, empirical evidence suggests that these two processes may differently relate to children's behavioral outcomes (Barth, & Bastini, 1997; Fine et al., 2004; Martin, Boekamp, McConville, & Wheeler, 2009). Results of a study by Barth and Bastini (1997), for example, demonstrated that emotion perception bias was a stronger predictor of preschoolers' negative social behaviors in classrooms (e.g., negative dependency on the teacher, aggression) than was emotion perception accuracy. Moreover, in another study, children's lower sadness perception accuracy predicted higher levels of externalizing behaviors, whereas no significant associations were observed between anger perception bias and behavior problems (Martin et al., 2009). Overall, these findings suggest that it is important to consider both emotion perception accuracy and emotion perception bias and that these aspects of emotion understanding differentially predict children's developmental outcomes.

The goal of this study was to examine the relations of children's emotion perception accuracy and emotion perception bias to their later disruptive behaviors. It was hypothesized that (a) parents' emotion-related socialization

behaviors and children's dispositional negative emotionality would predict children's emotion perception accuracy and emotion perception biases, (b) children's emotion perception accuracy and biases would uniquely predict children's disruptive behaviors, controlling for prior levels of aggressive behaviors, and (c) these emotion processing skills would mediate the relation between parenting behaviors and children's disruptive behaviors as well as the relation between children's negative emotionality and disruptive behaviors. Although not the major focus of the present study, differences in expressive language were controlled in the current study.

Development of Emotion Understanding

The ability to recognize emotions in others and to ascribe meanings to these emotions is an important aspect of emotional development during early childhood. There is evidence that by 7 months of age, infants begin to differentiate between some facial expressions (Nelson, 1987; Walker-Andrews, 1997). That is, infants tend to smile when they view positive facial expressions and become distressed and agitated when are confronted with angry faces (Haviland & Lelwica, 1987; Walker-Andrews, 1997; Walker-Andrews & Dickson, 1997), indicating that they recognize differences in these two valenced emotions. Between 24 and 28 months of age, children develop the ability to recognize basic emotions (e.g., anger, sadness and fear; Dunn, Bretherton, & Munn, 1987) and some children use the basic emotion words in their speech although these basic emotion words are often used to describe their own feeling states (e.g., I felt happy; Bretherton, McNew, & Beeghly-Smith, 1981). By

approximately 36 months of age and with the development of language, children have been observed to use basic emotion words in their conversations to discuss their own as well as others' emotions (Denham, 1986; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991). Indeed, Denham and Couchoud (1990) found that the ability to identify and to label emotional expressions (in self and in others) substantially increased from 2 to 4 years of age. Furthermore, the authors showed that (a) affective labeling emerged later than receptive identification of basic emotions (i.e., pointing to expressions), and (b) there were some variations in children's identification of facial expressions across different types of emotions (Denham & Couchoud, 1990). These researchers found that identification of happiness and sadness, in expressions or situations, were easier to identify for children of both age groups than identification of anger and fear, with fear being the most difficult emotion to be recognized.

Children's abilities to differentiate among negative emotions increase throughout the preschool years; Izard (1971) found that 5 years old children can recognize angry facial expression as easily as happy expressions. There is also evidence that most preschool-aged children can accurately report what type of emotion had been expressed by their peers and what had provoked those emotions (Fabes, Eisenberg, Nyman, & Miceaulieu, 1991; Izard, 1971). In addition, between the ages of 4 and 5, children become able to understand the desired-based emotions (to attribute an emotion to two people facing a similar situation but having opposite desires; Pons et al., 2003). By approximately 6 years of age, some children realize that others may simultaneously feel and express two

emotions (Saarni & Haris, 1991) and also can comprehend more complex emotions (e.g., pride, shame; Harter & Whitesell, 1989). It should be noted that research studies examining the development of emotion understanding during early childhood have focused on global emotion understanding, and no attention has been paid to examining the trajectories of emotion perception biases. Furthermore, most research studies on emotion perception biases have been conducted among school-aged children, and thus there is no evidence of how emotion perception biases develop during early childhood.

Although children's ability to understand emotions in expressions and situations increases as a function of age, evidence shows that even during the early years of development children noticeably vary in emotion understanding abilities (Dunn et al., 1991; Harris, 2000). For example, Dunn et al. (1991) demonstrated that at 33 months of age there are clear individual differences in children's emotion understanding ability, which were positively associated with the amount of emotion-laden discourse that children used in their conversations with family members. The individual variations in emotion understanding also have been found among older children (Harris, 2000; Pons et al., 2003). Specifically, Pons et al. (2003) tested emotion understanding in children of four age groups (4-5, 6-7, 8-9 and 10-11 years old) and found that there were marked individual differences in emotion understanding at each age group.

Furthermore, the individual differences in global emotion understanding appear to be relatively stable across time (Brown & Dunn, 1996; Hofer, 2006; Hughes & Dunn, 1998; Pons & Harris, 2005). For example, Brown and Dunn

(1996) found that children's affective perspective taking and labeling abilities were stable over the course of 3 years, from approximately 3 to 6 years of age. There is also evidence of stability in these skills from early to middle childhood (Hughes & Dunn, 1998; Pons & Harris, 2005). It should be noted that the development and stability of emotion perception biases in children have not yet examined by researchers, and thus, the current study was the first to examine the stability of this construct across time.

Early Predictors of Emotion Understanding

Examining the individual differences in emotion understanding is particularly important because a growing number of studies suggest that there is a positive association between children's early mastery of emotion understanding and social/emotional competence during the school years (Denham, McKinley, Couchoud, & Holt, 1990; Rubin, Bukowski, & Parker, 1998). Children's deficiencies in emotion understanding during early childhood seem to predict children's higher behavioral problems, poor school adjustment (Cassidy, Werner, Rouke, Zubernis, & Balaraman, 2003; Cook, Greenberg, & Kusche, 1994) and learning difficulties (Izard et al., 2001). Poor emotion understanding appears to be particularly problematic when children enter larger social contexts such as school and peer groups (Cassidy, Parke, Butkovsky, & Braungart, 1992; Dunn & Cutting, 1999). Because of the significant role that emotion understanding plays in children's social competence and adjustment during school years, many researchers have attempted to examine the individual characteristics and family mechanisms that contribute to variations in emotion understanding. In this

section, I will review the role of children's proneness to negative emotionality and parents' emotion-related socialization practices in predicting individual differences in emotion understanding abilities.

Child Characteristics

Emotional reactivity. Children's variations in emotion understanding have been explained by several factors including individual characteristics and family mechanisms (Bennett, Bendersky, & Lewis, 2005; Cutting & Dunn, 1999; Phillips, MacLean, & Allen, 2002). For example, it has been suggested that children who experience and express high levels of negative emotionality may be too over-aroused and focused on their own emotions to focus on others' emotional signals (Eisenberg et al., 1995; Izard et al., 2001). Thus, children's high reactivity may diminish their ability to understand emotional expressions and to process emotional information. Indeed, children's high level of dispositional reactivity often has been linked to lower levels of global emotion understanding (Carlson, Felleman & Masters, 1983; Cook et al., 1994; Denham, 1986).

The mood maintenance hypothesis (Clark & Isen, 1982) provides another explanation for understanding why children's level of affectivity may predict children's emotion understanding. According to the mood maintenance hypothesis, people with negative and positive affect have different motivations when they are processing information in the environment. People with positive mood are more likely to avoid negative thinking to maintain their positive mood, whereas people with negative mood are more likely to process information in ways to maintain and enhance their negative mood (Clark & Isen, 1982).

Although this hypothesis has not been tested among children, there is extant evidence showing that adults who experience high level of negative emotions have more bias toward identifying and attributing negative emotions to others' behaviors and emotional states (Caughlin, Huston, & Houts, 2000; Forgas, 1994).

Despite the lack of research on the associations between children's negative emotionality and emotion perception bias, there is evidence that children's experience and expression of negative emotions contribute to their emotion attribution bias (Dodge, & Somberg, 1987; Quiggle, Garber, Panke, & Dodge, 1992; Schultz et al., 2004). Emotion attribution bias, which has been thought to moderately correlate with children's emotion perception bias, refers to falsely attributing intention and emotions to others' behaviors when confronted with an ambiguous situation (Crick & Dodge, 1994; Dodge, 1985; Dodge, 1991). For example, a child with anger attribution bias who accidentally gets hit by a ball in the playground may view and interpret his peer's action as hostile while there is no evidence of angry cues in the environment. Emotion attribution bias occurs when the child fails to accurately encode and interpret the information in the environment, which includes emotional cues. Thus, the inaccurate encoding of emotions and misidentification of an emotion as another (emotion perception bias) may be an important factor affecting the interpretation of others' intentions and actions (Lemerise & Arsenio, 2000). For this reason, it has been suggested that emotion perception bias and emotion attribution bias in situations involving emotions may moderately and positively relate to each other (Fine et al., 2004; Schulz, Izard, & Ackerman, 2000). However, because the facial expressions are

only a small part of information that individuals receive for processing social information, it is important to differentiate between these two constructs (Fine et al., 2004).

The relation between children's dispositional tendency to experience particular emotions and their bias toward identification of that emotion was first proposed by Tomkins and McCarter (1964) who suggested that children may falsely attribute an emotion to others because of their frequent awareness of that emotion, whether experienced by themselves or observed in others. Thus, a child who frequently experiences negative emotions may be more likely to attribute negative emotions to others. It should be mentioned however that the positive association between misattribution of an emotion to others and experience of that emotion may be bidirectional. For example, a child who frequently misattributes positive emotions to others may more likely experience positive emotions himself. In contrast, a child who consistently misattributes anger to his classmates may more likely feel upset and angry.

The relation between experience of negative emotions and negative emotion attribution bias was directly examined by Schultz et al. (2000), in which first and second graders' expression of negative emotions were rated by their peers and teachers. The researchers found that children's expression of anger was related to higher anger attribution bias. Similarly, more frequent expression of fear predicted children's greater fear attribution bias. However contrary to what was proposed by Tomkins and McCarter (1964), higher levels of sadness were associated with greater anger attribution bias but not sadness attribution bias.

Overall, these findings suggested that children who are high in negative emotionality may be more likely to attribute negative emotions to others. In the current study, the association between children's temperamental proneness to negative emotions and negative emotion perception bias were examined both concurrently and over time.

Using four waves of longitudinal data, the relation between children's proneness to negative emotionality, emotion perception accuracy and emotion perception bias were examined. It was expected that children's high levels of negative emotionality would be related to low levels of emotion perception accuracy and high levels of emotion perception bias.

Family Variables

Children's emotion knowledge also appears to be related to family variables. Family context provides a learning environment for children in which they can learn about different emotions and various ways of interpretation and expression of them. In a model proposed by Eisenberg, Cumberland, and Spinrad (1998), three emotion-related socialization behaviors enacted by parents have been articulated to be related to emotion regulation. These three strategies include parents' expression of emotions, reaction to children's emotions, and emotional discourse. Each one of these strategies has been linked to children's emotional experiences including expression, and regulation of emotions. In addition, these emotion-related socialization behaviors have been thought to be important predictors of children's emotion knowledge (Dunn et al., 1991; Garner, 1999; Halberstadt & Eaton, 2003; McElwain, Halberstadt, & Volling, 2007). For

instance, it has been found that children of mothers who use more mental state words during their conversations have better emotion understanding abilities (Dunn et al., 1991). In the current study, I will focus on the contributions of two socialization behaviors, parents' emotional expressivity and reactions to children's negative emotions, to examine the unique contribution of each to children's emotion perception bias and emotion perception accuracy.

Parents' expressions of emotions. Family expressivity, defined as parents' general tendency to express emotions within the home environment has been related to children's variations in expression, regulation and understanding of emotions (Garner & Power, 1996; Halberstadt & Eaton, 2003; Valiente, Fabes, & Eisenberg & Spinrad, 2004). There are two reasons for expecting family expressivity to predict children's emotion understanding. First, emotions are more freely expressed within the home environment than other contexts; thus, children may be more exposed to various emotions at home (Matsumoto, Takeuchi, Andayani, Kouznetsova, & Krupp, 1998). Parents who moderately express positive and negative emotions provide more opportunities for their children to be exposed to different facial expressions and to learn about causes, antecedents and consequences of each emotion (Dunn, 1998). Next, children are likely more attentive and responsive to their parents' facial expression than to others' facial expressions. For example, Montague and Walker-Andrews (2002) found that infants preferred to look at their mothers' facial expressions than those portrayed by strangers. Children of depressed mothers also have been shown to be more sensitive to slight indicators of sadness and identification of sad facial expressions

(Lopez-Duran, Kuhlman, George, & Kovacs, 2010). Therefore, the family environment is clearly a very important context for forming children's emotion understanding.

It has been suggested that parents' expressiveness style (i.e., frequency and type of emotions displayed) may be important in shaping children's schemas about emotions and emotional expressions and that these emotional schemas may help children to understand, interpret and process others' emotional expressions (Dunsmore & Halberstadt, 1997; Dunsmore, Halberstadt, Damon, & Barrett, 1997; Izard, 2007). Indeed, empirical evidence suggests that children's exposure to different types of emotions may differentially predict children's emotion understanding (Halberstadt, Crisp, & Eaton, 1999; Halberstadt, Fox, & Jones, 1993). In a meta-analysis, Halberstadt and Eaton (2003) found that family negative-submissive expressivity (i.e., expression of sadness or crying) was related to children's lower emotion understanding, whereas family negative-dominant expressivity (i.e., expression of anger and hostility) and global expressivity were unrelated to children's emotion understanding. These findings suggest that exposure to different types of emotional expressiveness may have different implications for children's emotion understanding. Although Halberstadt and Eaton (2003) showed no relation between parents' negative-dominant expressivity (i.e., expression of anger) and children's emotion understanding, there is both empirical and theoretical support for the notion that parents' high levels of anger expression may negatively relate to children's emotion

understanding (Cassidy et al., 1992; Davies & Cummings, 1994; Denham, Zoller & Cuchoud, 1994).

Using the emotional security model, Davies and Cummings (1994) hypothesized that children become emotionally overaroused and distressed as the result of exposure to parents' anger and interadult conflict. Subsequently, it has been suggested that the overarousal may negatively relate to the performance on tasks that involve attention, decision making and perception (Yerkes & Dodson, 1908). Denham et al. (1994) found that children of mothers who expressed more anger during interactions with their children had lower emotion knowledge compared to children whose mothers displayed fewer angry expressions. Similar findings also have been detected among physically abused children (Pollak, Cicchetti, Hornung, & Reed, 2000), who are likely to experience high levels of anger at home. Nevertheless, researchers have shown that witnessing moderate levels of conflicts and negative emotions between parents, especially if the conflict has been resolved, may not predict children's maladjustment (Davies & Cummings, 1994). Thus, it is possible that a quadratic relation exists between parents' expressions of anger/hostility and children's emotion understanding. Perhaps children need to be exposed to these types of emotions at a moderate level to learn about them (Halberstadt et al., 1999), yet exposure to high and intense levels of negative affect may overwhelm children and disrupt their abilities to focus on other's emotions (Parke, Cassidy, Burks, Carson, & Boynum, 1992). The potential quadratic relations between parents' negative-dominant expressivity and children's emotion perception accuracy were examined in the

present study. It was anticipated that high levels of parents' negative-dominant expressivity would be related to children's lower emotion perception accuracy but the low and moderate levels of parents' negative-dominant expressivity would be positively related or be unrelated to children's emotion perception processes.

Despite somewhat consistent evidence for the association between negative-dominant expressivity and emotion understanding, there are mixed findings on the relation between negative-submissive expressivity and children's emotion understanding. Although Halberstadt and Eaton (2003) meta-analysis showed a negative association between parents' negative-submissive expressivity and children's emotion understanding, findings of several studies have shown that exposure to negative-submissive expressivity within the home environment may be beneficial and be positively related to children's sympathy- and empathy-related responding (e.g., Eisenberg et al., 1992; Halberstadt et al., 1999). For example, Eisenberg et al. (1992) found that exposure to negative-submissive expressivity within family was positively related to elementary school children's sympathy reactions. Overall, it is not evident whether children's exposure to family negative-submissive expressivity relates to negative or positive outcomes. One possible explanation for the mixed findings could be due to the intensity of negative-submissive expressivity measured across different studies. It is possible that only parents' high levels of negative-submissive expressivity, but not moderate or low levels of negative-submissive expressivity, relate to children's maladaptive information processing. For this reason, in the current study, the

potential quadratic relation between parents' negative-submissive expressivity and children's emotion perception accuracy were explored.

In addition, the relations between children's exposure to parents' negative expressivity and emotion perception bias also were examined in the current study. It was hypothesized that children may inaccurately attribute an emotion to others because of their experience and exposure to that particular emotion within the family (Tomkins & McCarter, 1964). Based on this argument, children's frequent exposure to high levels of negative emotions within the family may influence their bias toward these types of emotions. Although there is sufficient evidence on the associations between parents' negative emotional expressivity and children's global emotion understanding, thus far, only two studies have examined how children's exposure to high levels of negative emotions relates to their emotion perception bias (Fine et al., 2004; Schulz et al., 2000). The results of these studies showed that children who were exposed to higher levels of negative affect scored higher on anger perception bias. It should be noted that in both studies, the presence of negative affect within the home environment was indirectly assessed by measuring parents' use of physical discipline (Fine et al., 2004), and family instability (Schultz et al., 2000). In addition, only anger perception bias was examined in these studies. Thus, it is not clear how children's exposure to negative emotions would relate to other emotion perception biases (i.e., sadness and fear perception bias).

Recent evidence suggests that children of depressed mothers may be more biased and "over-sensitive" toward identification of sad facial expressions

(Lopez-Duran et al., 2010). That is, children of depressed mothers were more sensitive toward slight indicators of sadness, so that they would identify sadness even in ambiguous facial expressions compared to children of non-depressed mothers. Furthermore, there is evidence to show that children who are raised in families with high levels of negative-submissive expressivity (i.e., crying, sadness) show more sympathy and empathy reactions (Eisenberg et al., 1992; Michalik et al., 2007). These findings suggest that children who have been exposed to high levels of negative-submissive expressivity may be more sensitive in identifying those emotions. Thus, in the current study, the quadratic relation between parents' self-reported negative expressivity and children's perception bias toward negative emotions were examined. More specifically, it was predicted that parents' high levels of negative emotional expressivity would be negatively related to children's emotion perception bias, whereas the moderate and low levels of parents' negative expressivity were expected to be positively related or unrelated to children's emotion perception bias.

Overall, I expected to find a quadratic relation between parents' negative emotional expressivity and children's emotion perception accuracy, and a quadratic relation between parents' negative emotional expressivity and emotion perception bias over time.

Parents' reactions to emotions. In addition to parents' expressions of emotions, supportive and positive reactions to children's affective expressions also appear to predict children's higher emotion understanding (McElwain et al., 2007), whereas non-supportive and negative reactions (i.e., punitive/dismissing,

minimizing and distress reactions) appear to be negatively related to children's emotion understanding (Denham & Kochanoff, 2002; Eisenberg, Fabes, & Murphy, 1996; Jones, Eisenberg, Fabes, & Mackinnon, 2002). Parents' non-supportive reactions to children's emotions may encourage children to mask those emotions and thus may reduce children's opportunities to reflect and understand those emotions (Denham et al., 1994). In the current study, the associations between parents' non-supportive reactions and children's emotion perception accuracy were examined. It was predicted that parents' non-supportive reactions (i.e., punitive, minimizing, distress) would be negatively related to children's accurate identification of distinct emotions.

There is limited evidence for the associations between parents' non-supportive reactions and children's emotion perception bias. It has been found that children of parents who punish them for expressing negative emotions may become over-sensitive to identifying angry expressions because of the fear of punishment (El-Sheikh, Cummings, & Reiter, 1996; Scultz et al, 2000). Thus, these children may have tendency to falsely identify other negative emotions (i.e., sadness, fear) as angry. For example, a child who has been punished for expressions of negative emotions may become more sensitive toward angry expressions to protect himself from being punished, and thus may be more inclined to incorrectly identify sad and fear expressions as angry (anger bias). Thus, it was predicted that parents' non-supportive reactions would be positively related to children's emotion perception bias.

Children's Behavior problems

Emotional competence and early mastery of emotion understanding has been related to various positive outcomes among children including higher social competence, positive peer relationships, school adjustment and prosocial behaviors (Denham, 1986; Hubbard & Coie, 1994; Shields et al., 2001).

Conversely, children's deficiencies in several measures of emotion understanding have been linked to negative peer status, rejection/victimization and behavior problems among young school-aged children (Denham, 1986; Miller et al., 2005).

The social information processing model (SIP; Crick & Dodge, 1994) represents the basis for the association between emotion understanding and social competence in children. Indeed, the social information processing model has been extensively used to explain the relation between individuals' differences in attention to relevant signals and emerging behavior problems (e.g., Crick, 1995; Dodge & Price, 1994). According to this model, there are five different steps underlying socially competent behaviors, which include (a) encoding of the information in the environment, (b) interpretation of this information, (c) response creation (d) response assessment, and (e) behavioral enactment (Crick & Dodge, 1994). It has been suggested that the person's failure in one of these processing steps including encoding and interpreting information in the environment may relate to poor social competence and development of behavioral problems, particularly aggressive behaviors (Dodge & Price, 1994; Fontaine & Dodge, 2009). Although the social information processing models' emphasis is more on cognitive processes, it has been argued that emotion processing also plays a

significant role in these models. (Burgess, Wojslawowicz, Rubin, Rose-Krasnor, & Booth-LaForce, 2006 ; Lemerise & Arsenio, 2000). Lemerise and Arsenio (2000) proposed a revised model of SIP model, in which they incorporated emotion processes such as emotion recognition and emotional reactivity into the Crick and Dodge (1994) model. According to their model (see Figure 1), children's differences in accurate identification of emotions is an important component of the first step of social information processing, which influence other steps of SIP model (Fine et al., 2004). Indeed, Dodge, Laird, Lochman, & Zelli (2002) found that children's failure in the second through fifth steps of SIP (interpretation of information in the environment, and response creation and assessment) mediated the relation between first step (children's accurate encoding of cues in the environment that includes emotional cues) and aggressive behaviors, suggesting that emotion perception and understanding preface the other steps of social information processing. This finding suggests that children's inaccurate identification of emotions and emotion perception biases may influence children's subsequent generated response and behavioral reaction.

Children's low global emotion understanding has been repeatedly linked to externalizing behavior problems (e.g., aggressive behaviors; Denham et al., 1990; Denham et al., 2002; Izard et al., 2001). In terms of accurate identification of distinct emotions, researchers suggest that children who have deficiencies in processing sad and fearful emotional expressions may more likely display antisocial and aggressive behaviors (Marsh, Kozak, & Ambady, 2007; Stevens, Charman, & Blair, 2001). For example, Martin et al. (2009) found that children's

low sadness perception accuracy positively predicted externalizing behavior problems. Overall, these findings suggest that children's accurate identification of emotions may negatively relate to children's aggressive and disruptive behaviors. In the current study, the direct relation between children's emotion perception accuracy and disruptive behaviors were examined.

It has also been found that children with emotion perception biases may be at higher risk for displaying externalizing and less socially competent behaviors (Barth & Bastiani, 1997; Fine et al., 2004). For instance, Schultz et al. (2004) showed a positive relation between children's anger perception bias and aggressive behaviors among first- and second graders. In the present study, children's emotion perception bias was expected to be positively related to children's disruptive/aggressive behaviors over time.

Mediating Role of Emotion Understanding

Parents' non-supportive reactions to children's emotions and high levels of negative emotional expressivity, particularly anger expressions have been found to predict children's higher levels of behavior problems (Rubin, Hastings, Chen, Stewart, & McNichol, 1998; Chang, Schwartz, Dodge, & McBride-Chang, 2003; Jones et al., 2002). However, it is likely that these two emotion-related parenting practices indirectly predict children's behavioral problems through relations with children's emotion understanding. Indeed, children's emotion understanding has been suggested as one potential pathway accounting for the relations between parents' socialization practices and children's social competence (Cassidy et al., 1992; Cunningham, Kliewe, & Garner, 2009; Izard et

al., 2008). For example, Cassidy et al. (1992) found that children's emotion understanding mediated the relation between parents' modest levels of emotional expressivity and children's positive peer relationships. Cunningham et al. (2009) also found that children's high emotion understanding mediated the relation between parents' emotional socialization, measured by five indicators which included parents' awareness and acceptance of their own and their children's emotions, and children's fewer behavior problems. Thus, it was predicted that parents' non-supportive reactions and negative expressivity would be negatively related to children's emotion perception accuracy, which in turn would be positively related to children's aggressive/disruptive behaviors over time.

In addition to testing the mediational role of emotion perception accuracy, children's emotion perception bias will also be examined as a possible pathway between parenting and disruptive behaviors. The expectation that children's emotion perception bias may mediate the relations between parents' negative socialization and behavior problems is based on research studies showing that (a) negative parenting may relate to children's inaccurate information processing (Dodge, Bates, & Pettit, 1990) and (b) children's socially competent behaviors hinge on successful and competent information processing (Dodge, 1986; Fine et al., 2001). Fine et al. (2004) examined the mediational role of anger perception bias in the relation between parents' use of harsh discipline and children's aggressive behaviors, and found no associations between parents' enactment of harsh discipline and children's anger perception bias. However, it should be noted that in the Fine et al. (2004) study, parents' harsh discipline was utilized as the

indicator of parenting rather than measuring parents' negative emotional expressivity. In addition, the sample that was used in the Fine et al. (2004) study comprised of economically disadvantaged African American families, in which use of harsh discipline may be more common and normative parenting practice (Tamis-Lemonda, Briggs, Rahil, McClowry, & Snow, 2008). As a result, use of harsh discipline within this ethnic group may not relate to the same negative outcomes observed within other ethnic groups (e.g., European Americans). Moreover, the authors focused on older school aged children. In the current investigation, predictors of children's aggressive behaviors were measured prior to children's entrance to school. Because children's emotion understanding develops during the preschool period, it is important to examine the predictions at younger ages. In the current study, it was predicted that children's emotion perception bias mediated the relation between parenting practices that are characterized by hostility (non-supportive reactions and parents' negative expressivity) and aggressive/disruptive behaviors. The mediational model was tested over time, controlling for earlier levels of parents' negative expressivity, anger perception bias, and anger perception. Using four waves of longitudinal data, the aim of the current hypothesis was to examine one possible mechanism through which early childhood experiences would relate to children's emotion processing ability and aggressive behaviors.

The two aforementioned mediation models were also tested with children's proneness to negative emotionality. According to Lemerise and Arsenio (2000; Figure 1), children's differences in emotionality is a component of

the first step of the revised social information processing model, which influence the other steps. Thus, children's differences in emotionality may not only influence children's encoding and interpretation of emotions but also may influence the final step of social information processing that is the response generation or the transformation of cognitive evaluations into behavioral reactions. Indeed, it is possible that children's temperamental differences motivate them to consider different behavioral reactions in response to their perceptions of emotional cues. Schultz et al. (2004) tested the mediating role of children's emotion processing skills in the relations of children's proneness to positive/negative emotions and aggression in classroom. The researchers found that children's emotion processing risk index (low emotion attribution accuracy and high emotion perception bias) mediated the relation between children's proneness to positive emotions and children's low levels of aggressive behaviors. However the meditational relation was not supported for other emotions (e.g., anger). In the Schultz et al. (2004) study, first and third graders' peers reported on children's negative emotionality, whereas in the current study, parents' and non-parental caregiver reported on children's proneness to distinct negative emotions. Reports from mothers and non-parental caregivers about children's temperamental characteristics may be more valid than peer reports because they are able to observe children in various situations throughout the day (Gartstein & Marmion, 2008). In the current study, it was expected that children's emotion perception accuracy and children's emotion perception bias would mediate the relation between children's proneness to negative emotions and

aggressive/disruptive behaviors. In addition, the relations between children's negative emotionality, emotion perception bias, emotion perception accuracy and aggressive behaviors were examined longitudinally in a sample of younger children.

Control Variables

Language. Language provides children with an important tool for discussing and labeling emotions, as children's differences in language ability have been shown to be associated with better emotion understanding (Cutting & Dunn, 1999; Izard et. al., 2001). The positive associations found between language ability and emotion understanding also suggests that there may be a bidirectional relation between these two variables (Denham et al., 1994; Pons et al., 2003; Smith & Walden, 1998). Children with better emotion understanding may more likely use language to discuss their own and others' affective states. Furthermore, emotion understanding has been suggested as a potential pathway explaining how children's differences in language ability relate to socially competent behaviors. In fact, Izard et al. (2001) found that children's emotion understating mediated the relation between verbal ability and social competence among preschool aged children. Because some measures of emotion understanding require children to verbalize emotional expressions (Denham, 1998), children who have poor expressive language may also score lower in emotion understanding. Thus, similar to other studies, children's expressive language was controlled in the present study.

Earlier levels of aggression. The early onset of aggression has been suggested as a significant precursor of behavior problems including aggressive and externalizing behavior problems during middle childhood (Kellam, Rebok, Ialongo, & Mayer, 1994). However, the aggression in social contexts (e.g., classroom, family context) have been found to exacerbate or attenuate the relation between early and later levels of aggressive behaviors (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Lyons-Ruth, 1996; McFadyen-Ketchum, Bates, Dodge, & Pettit, 1996). For example, Kellam et al. (1998) found that the aggressive first-graders in high aggressive classrooms displayed more aggressive behaviors by the end of first quarter than aggressive boys in low aggressive classrooms. McFadyen-Ketchum et al. (1996) also found that the coercive and non-affectionate patterns of mother-child interactions predicted increase in aggressive behaviors from kindergarten to third grade regardless of children's earlier levels of aggression. Because of the evidence for the associations of early aggression and aggressive behaviors, it is important to control for children's earlier levels of aggression when examining the unique predictive ability of parenting and children's emotion processing in predicting later aggressive behaviors. Thus in the present study, the earlier levels of aggression was controlled in analyses that involve aggressive behaviors.

The Current Study

The objective of the current study was to longitudinally examine (a) the contribution of negative parenting practices (i.e., parents' negative expressivity, parents' non-supportive reactions) and children's temperamental proneness to

negative emotions to children's emotion perception accuracy and emotion perception bias during preschool years, (b) the contributions of children's emotion perception accuracy and bias to aggressive/disruptive behaviors, and (c) the mediating roles of children's emotion perception bias in the links between parents' emotion related socialization behaviors, children's temperamental proneness to negative emotions and children's aggressive/disruptive behaviors. By utilizing four waves of longitudinal data, the stability of these constructs were examined, and in some cases, the stability was controlled. In addition, children's earlier levels of expressive language and aggressive behaviors were controlled in testing the models.

Based on findings from research studies reviewed in the previous section, five main hypotheses were tested in the current investigation. Hypothesis 1 was that high levels of mothers' negative emotional expressivity and non-supportive reactions would be positively associated with children's emotion perception bias and would be negatively related to children's emotion perception accuracy (see Figure 2). The aim of this hypothesis was to test whether parenting practices that expose children to negative emotions would contribute to children's affective-cognitive processes related to those emotions. Specifically, it was predicted that mothers' high levels of negative emotional expressivity and non-supportive reactions at T1 and T2 would be positively associated with children's emotion perception bias and would be negatively related to children's emotion perception accuracy, both concurrently and over time. The paths between mothers' negative-dominant and -submissive expressivity and children's emotion perception

accuracy and bias were examined for quadratic relations. It was expected that low and moderate levels of mothers' negative emotional expressivity would be positively related or unrelated to children's emotion perception accuracy, whereas mothers' high negative expressivity would be negatively related to emotion perception accuracy. In addition, it was expected that high levels of exposure to mothers' negative emotional expressivity, but not low or moderate levels of expressivity, would be related to children's high emotion perception bias, both concurrently and over time.

In addition to mothers' socialization practices impacting children's emotion perception bias and emotion perception accuracy, it is possible that children's proneness to negative emotions also plays a role in children's emotional-cognitive processing (Schultz et al., 2004; Tomkins & McCarter, 1964). Hypothesis 2 was that children's proneness to negative emotion at T1 and T2 would be positively associated with negative emotion bias and negatively related to emotion perception accuracy over time, even after controlling for the stability of these constructs (see Figure 3).

Children's deficiencies in different aspects of emotion understanding have been found to be predictive of later antisocial and aggressive tendencies (Denham et al., 1990; Izard et al., 2001). Specifically, children's difficulties to identify fear and sadness and bias toward anger have been related to high levels of aggressive behaviors and antisocial tendencies (Marsh et al., 2007; Stevens, et al., 2001). Hypothesis 3 was that children's low emotion perception accuracy and high emotion perception bias at T2 and T3 would be related to children's high

aggressive/disruptive behaviors at T5 (see Figure 2, 3). Testing the relations between emotion perception biases was also included in the analyses. However, the directions of these relations were not specified because of the lack of empirical and theoretical evidence for generating specific hypothesis.

As documented by previous research, childhood experiences including exposure to high levels of negative emotions in the family play an important role in predicting children's aggressive behaviors and anger perception bias (Fine et al., 2004; Schultz et al., 2004). Children's understanding of emotions has been suggested as a potential pathway explaining why negative parenting practices relate to children's later behavior problems (Cassidy et al., 2002; Cunningham et al., 2009; Dodge et al., 1990). Hypothesis 4 was that the relation between T2 and T3 parents' emotion-related socialization practices (parent's negative emotional expressivity and non-supportive reactions to children's negative emotions) and T5 children's aggressive/disruptive behavior problems would be mediated by children's anger perception bias and emotion perception accuracy (see Figure 2). Using four waves of longitudinal data, the goal of this hypothesis was to examine whether early childhood experiences relate to children's understanding of emotions and aggressive/disruptive behaviors.

Because parents' negative emotional expressivity may impact children's affective expression, the aforementioned mediational model was examined by considering children's negative emotional expressivity. Hypothesis 5 was that the relation between children's expression of negative emotions at T2, T3 and T4 and

aggression at T5 would be mediated through children's emotion perception accuracy and bias (Figure 3).

This study builds on the existing literature by examining the longitudinal relations between maternal socialization practices, children's proneness to negative emotions, children's emotion understanding and disruptive behaviors. Rather than examining global emotion understanding, which has been often used by previous researchers, the focus of this study was on the two specific and separate components of emotion understanding (emotion perception bias and emotion perception accuracy).

Method

Participants

The children and families who participated in this study were part of a larger longitudinal study of toddlers' emotions, emotion regulation and social competence. Mothers and their infants were recruited at birth from three local hospitals in the Southwest. These three areas were chosen to obtain a racially and economically diverse sample. Mothers were contacted and were invited to participate in the study. The eligibility criteria for participating in this study were as follows: the baby was full-term and healthy, parents were both 18 years of age or older, and the family planned to stay in the same geographical area for at least 2 years. Demographic information was obtained from three hundred and fifty-two families who met the eligibility criteria and consented to participate in the study and to be contacted for further participations.

Parents came to the laboratory visits when their children were 18, 30, 42, and 54 months of age. Because of children's limited language abilities at 18 months, emotion understanding data were not collected at this time point. Thus, only data from 30, 42, and 54 months laboratory assessment are used in the current study. Prior to each laboratory assessment when children were 24, 36 and 48 months of age, mothers completed a packet of questionnaires that included a questionnaire about parents' emotional expressivity within the family. Mothers were asked to complete the questionnaires and return them by mail; some mothers brought the packet with them to the laboratory visit and if the questionnaires were not returned at the laboratory visit, the mother was asked to complete them during the laboratory visit. At 72 months, teachers and parents completed a questionnaire about toddlers' aggressive/disruptive behaviors. Teachers' contact information was provided by the mothers. Teachers and parents received a payment for completion of these questionnaires. To reduce the complexity of analyses, we combined the questionnaires collected up to 6 months prior to the laboratory visit (but often less than 6 months and in some cases during the laboratory visit) with the data collected at the laboratory visit to be considered as a single time point. In addition, the time points were labeled in a way to be consistent with other studies using the same sample, in which 18 month was considered Time 1 (T1). Thus, Time 2 (T2) will refer to 24 and 30 months, Time 3 (T3) will refer to 36 and 42 months, Time 4 (T4) will refer to 48 and 54 months and Time 5 (T5) will refer to 72 months (see Table 1).

The number of families who had valid data at each time point was as follows: 239 families at T2 (133 boys and 106 girls; ages at T2 lab visit 28.3 to 31.0 months, $M = 29.85$ months, $SD = .70$), 226 families at T3 (127 boys and 99 girls; ages at T3 lab visit 39.2 to 44.2 months, $M = 41.79$ months, $SD = .75$), 203 families at T4 (114 boys and 89 girls; ages at T4 lab visit 52.0 to 57.2 months, $M = 53.90$ months, $SD = .78$), and 162 families at T5 (90 boys and 72 girls). Some families only completed questionnaires ($ns = 14, 18, 0,$ and 0 for T2, T3, T4 and T5 respectively) and data were collected from non-parental caregivers and teachers via questionnaires ($ns = 153, 151$ and 145 , for non-parental caregivers at T2, T3 and T4, and 144 for teachers at T5).

Although the majority of children in the sample were Caucasian (83.7% , 83.6% , 83.3%, 85.2% for T2, T3, T4 and T5 respectively), African-American (5.4%, 5.8%, 5.9% , and 6.2%, for T2, T3, T4 and T5 respectively), Asian (2.5%, 2.2%, 2.5% , and 2.5%, for T2, T3, T4 and T5 respectively) and Native-American (4.6%, 2.2%, 2.5%, and 4.9% , for T2, T3, T4 and T5 respectively) were also represented with some participants rated as others (1.3%, .9%, 1.0%, and .6% , for T2, T3, T4, and T5 respectively) and some who did not report any race (1.3% , .9%, .5%, and .6%, for T2, T3, T4, and T5 respectively). In terms of children's ethnicity, most of children were non-Hispanic (77.4%, 77.9%, 77.3% and 79%, for T2, T3, T4 and T5 respectively) with 22.6%, 22.1%, 20.7%, and 21.0%, for T2, T3, T4 and T5 respectively of Hispanic origin. For all time points, parents' education ranged from 8th grade to the doctoral degree, with the average of some college or 2 year degree for both mothers and fathers.

Procedure

Toddlers and their mothers came to a laboratory on campus when children were 30-, 42-, 54- and 72- months old (called T2, T3 and T4, T5 respectively). Upon their arrival, a trained undergraduate research assistant greeted the mother and her toddler. The research assistant then guided the mother and toddler to the testing room where the tasks were administered. Toddlers participated in approximately 20, 24 and 28 tasks during the laboratory session, for T2, T3 and T4 respectively. These tasks varied or were slightly modified across time points to be age-appropriate. Each laboratory assessment approximately lasted 1 ½ to 2 hours and was videotaped for later coding. Only the procedure to assess children's emotion understanding that is relevant to the current study is discussed in detail in the following section. The mothers were asked to remain uninvolved throughout the laboratory tasks that involved only children and were encouraged to complete a series of questionnaires, which included a questionnaire about mothers' reactions to children's negative emotions. At the end of each lab assessment, the participants were debriefed and received a payment for their participation in the lab visit and completion of the home questionnaires. Children also received age-appropriate toys and a t-shirt.

The contact information of non-parental caregivers and teachers was provided by the mothers. The non-parental caregivers and teachers were then contacted and sent a packet of questionnaires to complete. Teachers and non-parental caregivers were asked to return the questionnaire by mail and were paid for their participation.

Measures

Parents' expressivity. Mothers completed the Self-Expressiveness in the Family Questionnaire (SEFQ; Halberstadt, Cassidy, Stifter, Parke, & Fox, 1995) at 24 (T2), 36 (T3), and 48 (T4) months, which measured the degree to which mothers expressed negative and positive emotions at home. The SEFQ included three subscales that measured mothers' positive, negative- dominant (e.g., anger, hostility) and negative- submissive (e.g., expressions of sadness and crying) emotional expressivity. Only the negative-dominant (10 items) and negative-submissive expressivity (10 items) subscales will be used in the current investigation. Examples of negative- dominant expressiveness included "Criticizing someone for being too late" and "Showing contempt for another's action." Mothers rated each item on a 9-point scale, with *1 = I rarely express these feelings* to *9 = I frequently express these feelings*. The Cronbach's alpha for the negative-dominant expressivity subscale at T2, T3 and T4 were .79, .83, and .82, respectively, and for negative-submissive expressivity at T2, T3 and T4 were .68, .72, and .75, respectively.

Parents' non-supportive reactions. Mothers also reported on their reactions to children's negative emotions (e.g., anger, fear, sadness) using the Coping with Children's Negative Emotions Scale (CCNES; CTNES; Eisenberg & Fabes, 1994) at the 30-, 42- and 54- month lab visits (T2, T3 and T4 respectively) lab visits. On a 7-point scale (*1=very unlikely* to *7=very likely*), mothers rated the degree to which they (1) reacted punitively to manage children's display of negative emotions (punitive reactions; e.g., get angry at my child; $\alpha = .81, .75, .75$

for T2, T3, and T4 respectively), (2) devalued children's emotions or the situation causing those emotions (minimizing reactions; e.g., Tell my child that he is making a big deal out of nothing; $\alpha = .85, .85, .77$ for T2, T3 and T4 respectively), and (3) became distressed and upset when their children expressed negative emotions (e.g., distress reactions; e.g., Feel upset myself; $\alpha = .81, .83, .68$ for T2 and T3 and T4 respectively).

Children's expressive language. At T2 and T3, mothers completed the short form of the MacArthur Communicative Development Inventory (CDI- Level II; Fenson et al., 2000). This measure contains 100- word vocabulary production checklist, and has demonstrated good validity and reliability ($\alpha = .97$; Fenson et al., 2000). Because some parents in our sample were bilingual, a sum of number of spoken words in either English or Spanish was calculated.

At T4, children's language skill was tested using the Verbal Comprehension Index (VCI) of Wechsler Preschool and Primary Scale of Intelligence (Wppsi; Wechsler, 1967). The VCI includes tests of receptive and expressive language as well as verbal reasoning. Because the language measures used at T2 and T3 did not include receptive vocabulary, only children's expressive scores were used in the current study. To assess children's ability to express the meaning of words, children were asked to name a series of items (5 pictures and 20 verbal items). The obtained raw scores were standardized using the table presented in the WSII manual.

Family Socioeconomic Status (SES). At T2, mothers reported on the family annual income (1 = less than \$15,000; 7 = over \$100,000) and each

parents' highest level of education (1= *grade school*; 7= *PhD, JD or MD*). The socioeconomic status (SES) composite then was computed by averaging family annual income, and mothers' and fathers' highest level of education. Highest numbers represented higher family SES.

Children's emotion understanding. Toddlers' emotion perception bias and emotion perception accuracy were assessed during the laboratory visits at T2, T3, and T4 with the affective perspective-taking procedure advanced by Denham (1986). In the affective perspective task, the experimenter enacted 20 vignettes with three puppets. These three puppets included the child, mother and a sibling. The puppet's gender was matched with the child's gender. Each vignette depicted a situation, in which the protagonist felt a certain emotion (e.g., angry, sad, fearful, happy). The affective perspective task included 8 stereotypical vignettes (depicting an emotion that most children would feel in that situation) and 12 non-stereotypical vignettes (depicting an emotion that was different from the emotion that child would feel in similar situation; the information on the child's emotional response to each situation was obtained from mother prior to the laboratory assessment). It should be noted that only data from the stereotypical segment are used in the current study, in which the experimenter used three puppets to act out 8 vignettes (each emotion was depicted twice). The experimenter enacted the vignettes and made appropriate facial expressions and vocalization (e.g., Mommy is going to take me to the zoo, oh I love the elephants—the experimenter made happy faces and showed excitement). The correctness score ($1=pass$ or $0=fail$)

was assigned depending on whether children accurately labeled the target emotion.

Emotion perception accuracy. Children's emotion perception accuracy was calculated following the procedure used by Fine et al. (2004). For each emotion, the number of times that the child correctly recognized the emotion was calculated and squared (hit rate). This number was then divided by the number of times that emotion was the correct expressed emotion (the number of vignettes depicting each emotion was two) multiplied by the number of times the emotion was labeled as the target emotion across all vignettes. For example, if the child correctly labeled anger in two 'anger' vignettes and also incorrectly labeled anger as the target emotion for one of the sad vignettes, the child's anger perception accuracy was $.67 (2^2 / 2*3)$. The child's overall emotion perception accuracy was calculated by averaging the child's perception accuracies for each emotion (sad, fear, anger).

Emotion perception bias. For each emotion, the child's perception bias was calculated using the following procedure. The number of times child labeled an emotion when the emotion was not the correct target emotion was calculated. This number was then divided by the number of incorrect answers the child provided across 6 vignettes. For example, if the child incorrectly identified the two sad vignettes as anger and had five incorrect answers for non-anger items, the child's anger perception bias was $(2/5=.4)$.

Children's dispositional negative emotionality. On a 7-point scale, mothers and caregivers reported about the frequency of children's display of

negative emotions using the ECBQ (Early childhood behavior questionnaire; Rothbart, 2000; 1 = *never* and 7 = *always*) at 30 months (T2) and the CBQ (Child behavior questionnaire; Rothbart, Ahadi, Hershey, & Fisher, 2001; 1 = *extremely untrue of your/this child* and 7 = *extremely true of your/this child*) at 42 and 54 months (T3 and T4, respectively).

At T2, mothers and non-parental caregivers answered 12 items about children's frustration (e.g., When tired after a long day of activity, how often did your child become frustrated; $\alpha = .81$ and $.84$, for mothers and caregivers respectively). At T3 and T4, mothers rated 13 items and caregivers rated 11 items about children's expression of anger (e.g., Gets mad when even mildly criticized; $\alpha = .78$ and $.83$, for mothers and caregivers, respectively, at T3, and $\alpha = .80$, and $.84$, for mothers and caregivers, respectively, at T4). At T2, mothers rated 12 items about children's expression of sadness (e.g., While having trouble completing a task, how often did your child become sad?; $\alpha = .82$ and $.79$, for mothers and caregivers respectively). At T3 and T4, mothers and caregivers rated 13 identical items about children's expression of sadness (e.g., Tends to become sad if the family's plans don't work out; $\alpha = .77$ and $.74$, for mothers and caregivers, respectively, at T3, and $\alpha = .74$, and $.73$, for mothers and caregivers respectively, at T4). At T2, mothers and caregivers rated 11 items about children's expression of fear (e.g., When visiting a new place, how often did your child not want to enter; $\alpha = .75$ and $.79$ for mothers and caregivers, respectively). At T3 and T4, mothers and non-parental caregivers rated 13 items about children's expression of fear (e.g., Is afraid of getting lost; $\alpha = .76$ and $.70$, for

mothers and caregivers, respectively, at T3 and α s=.77 and .65, for mothers and caregivers, respectively, at T4).

Children's aggressive/disruptive behaviors. At T2, T3 and T4, mothers and caregivers completed the Infant and Toddler Social and Emotional Assessment (ITSEA; Carter & Briggs-Gowan, 1999). Using a 3-point scale (1 = *not true/rarely*, 2 = *somewhat true/sometimes*, or 3 = *very true/often*), mothers and caregivers rated items of aggression/defiance and peer aggression scales. The aggression/defiance scale was comprised of three subscales: defiance (3 items; e.g., "Has temper tantrums."), relational defiance (3 items; e.g., "Misbehaves to get attention from adults."), oppositional/defiance (3 items; e.g., "Hits, bites, or kicks you or other parent."), and dispositional aggression (3 items; e.g., "Acts aggressive when frustrated."). The peer aggression scale comprised of two subscales: peer-relational aggression (3 items; e.g., "Teases other children."), and peer-overt aggression (3 items; e.g., "Picks on or bullies other children."). The items for each subscale were identical for mothers and caregivers. An aggression composite was computed by averaging the aggression/defiance and peer aggression scales, α s = .70, and .83, for mothers and caregivers, respectively, at T2, α s = .70, and .83, for mothers and caregivers, respectively, at T3, and α s = .66, and .82, for mothers and caregivers, respectively at T4.

At 72 months (T5), mothers and teachers rated disruptive behaviors using two scales from the using the Child Symptom Inventory-4 (CSI-4; Gadow & Sprafkin, 2002), which has been designed to match the DSM-IV. Subscales used in the current study were oppositional defiant disorder (ODD; 8 items; e.g., "Is

angry and resentful”) and conduct disorder (CD; 14 items; e.g., “Starts physical fights”). Items in the two subscales were rated on a 4-point scale (*0=never* to *3=very often*). The reliabilities (Pearson correlations) for mothers were .85 and .66 and for teachers were .91 and .81, for ODD and CD respectively.

Analytic Plan

The descriptive statistics, frequencies and correlations were conducted. The variables were checked for the normality and those variables that were highly skewed were transformed. In addition, variables with extremely low variability were dropped. Because of the longitudinal nature of the study, attrition analyses were performed to compare those families who participated in the study with those who attrited over time.

Further analyses were conducted based on the significant relations using Structural Equation Modeling (SEM) with Mplus version 6.0 (Muthén, & Muthén, 1998-2010). First, the confirmatory factor analyses were conducted to test whether the observed parenting and negative emotionality relate to the latent factors at all time points. Next, the invariance among constructs was tested by constraining factor loading to be equal over time. The direct paths among the latent constructs were examined: (1) the direct paths from parenting to children’s emotion perception accuracy and emotion perception bias, (2) the direct paths from children’s proneness to negative emotions to children’s emotion perception accuracy and emotion perception bias, (3) the direct paths from children’s emotion perception accuracy and emotion perception bias to aggressive behaviors.

In addition to testing the direct paths, the indirect effects of emotion perception accuracy and emotion perception bias in the relation between predictors (parenting, negative emotionality) and aggressive/disruptive behaviors were examined.

Lastly, additional regression analyses were conducted to examine the quadratic relations between mothers' negative expressivity (i.e., negative-dominant expressivity, negative-submissive expressivity) and emotion perception variables.

Results

Data Reduction

Correlations between study variables within-time were examined. If analogous variables by different reports were correlated with each other, the variables were standardized and averaged to form composites that could be used in further analyses. The aggregated scores were created to reduce the complexity of analyses and to increase the reliability (Rushton, Brainerd, & Pressley, 1983).

Parenting. Mothers' reports of negative-dominant and submissive expressivity were positively correlated with each other concurrently (see Tables 2, 3, and 4). However, because these two different types of negative-expressivity were predicted to differentially relate to children's bias toward distinct negative emotions, the two types of parental negative expressivity were not aggregated within-time and were used as separate indicators of parenting in further analyses.

Mothers' non-supportive reactions (i.e., punitive, minimizing, and distress reactions) were also positively correlated with each other within-time with the

exception of the correlations between T2 mothers' distress and minimizing reactions. Thus, within each time, an aggregate score was computed by averaging mothers' reports of punitive, minimizing and distress reactions to reflect mothers' non-supportive reactions to negative emotions.

Children's negative emotionality. Mothers' and caregivers' reports of children's expressions of distinct negative emotions (e.g., anger, sadness, fear) tended to be significantly and positively correlated (see Table 2, 3, and 4) with the exception of mothers' and caregivers' reports of 30-month sadness. Given the fact that the mothers' and caregivers' reports were positively related to each other within each time, composite scores at each time were created by averaging mothers' and caregivers' reports of anger, sadness and fear to reflect children's expressions of the three distinct negative emotions to be used in further analyses.

Children's emotion perception. Recall that we created variables to reflect both emotion perception accuracy (for each emotion separately) and to reflect emotion perception biases (for each emotion separately). The correlations between anger, sadness and fear accuracy were positive and significant within each time (see Table 2, 3, and 4), and thus, these scores were averaged to create a composite of overall emotion perception accuracy. The analyses did not include happy bias because the current proposal aimed to focus on negative biases as they were thought to more strongly relate to children's maladjustment. Therefore, the happy accuracy variables were excluded in calculating overall emotion perception accuracy at each time point.

The concurrent correlations among anger, sadness and fear biases were not significant with the exception of the associations of T3 anger bias to T3 sadness and fear bias, $r_s(192) = -.15$ and $-.15$, $p_s < .05$, for sadness and fear bias, respectively. Because anger, sadness and fear perception bias, for the most part, were independent of one another, they were used as separate indicators of emotion perception bias construct in further analyses.

Children's conduct problems. The correlations between mother- and teacher- reported conduct problems were positive and significant, $r(132) = .22$, $p < .05$. Thus, mothers' and teachers' scores of children's conduct problems were standardized and averaged to create a composite of children's conduct problems.

Children' earlier levels of aggression. Mothers' and teachers' reports of aggressive behaviors at T2, T3 and T4 were positively correlated with each other both within and across time, $r_s(112 \text{ to } 222) = .24 \text{ to } .62$, $p_s < .01$. Thus, a total "early" aggression score was computed by averaging mothers' and teachers' of aggressive behaviors within and across time. This total score was used in the subsequent analyses that involve examining children's conduct problems to control for the earlier levels of aggression.

Following data reduction procedure, the descriptive statistics, and the correlations between variables of interest within and across time were examined. Next, the hypotheses of the study were examined using correlations. The two hypothesized models (see Figures 2 and 3) then were examined with two structural equation models using *Mplus*, and the quadratic relation between

parents' negative expressivity and emotion perception variables were tested using regression analyses.

Descriptive Statistics

Means and standard deviations of the study variables are reported in Table 5 (for the individual variables and composites). The univariate normality of study variables was tested using the descriptive statistics and Q-Q plots in SPSS.

Variables with skewness greater than 2 and kurtosis greater than 7 were transformed following the suggestion by Curran, West, and Finch (1996). Study variables that were corrected using inverse transformation included T3 fear perception bias (skew = 2.48, kurtosis = 4.87), T4 anger perception bias (skew = 2.38, kurtosis = 4.37), and T4 fear perception bias (skew = 5.38, kurtosis = 29.72). The aforementioned variables could not be normalized using any form of transformation. The best results were obtained using inverse transformation; however, even using this form of transformation, the skew and kurtosis of variables were outside the acceptable range: T3 fear perception bias (skew = -2.09, kurtosis = 2.98), T4 anger perception bias (skew = -2.09, kurtosis = 2.75), and T4 fear perception bias (skew = -4.78 kurtosis = 22.34). The scores on these variables demonstrated that very few children showed these types of biases. Recalling that bias scores ranged between 0 and 1 with higher scores showing higher bias, only 8 out of 174 children showed any (a score greater than 0) T4 fear bias and 28 out of 174 children showed any T4 anger bias. In addition to these variables, the distribution of T4 sad bias was bimodal, indicating that the variable also violated the assumption of normality. Thus, the four aforementioned

variables were categorized as follows. If half or more of the child's incorrect responses were of a particular emotion (i.e., anger, sadness, fear), the child was coded as having bias toward that particular emotion. Twenty-three, 72 and 7 children out of 174 displayed anger, sad and fear bias, respectively at T4 and only 21 children out of 192 displayed fear bias at T3.

Sex Differences

Differences between girls and boys on all study variables were examined at T2, T3, T4, and T5 using a series of independent *T*-tests and chi-square tests (observed sex differences are presented by * in Table 5; chi-square tests were used to examine sex differences for categorical variables). Mothers expressed more negative-dominant expressivity toward girls than boys at T2 ($N_s = 101$ and 113 , $M_s = 3.81$ and 3.44 , $SD_s = 1.18$ and 1.05 , for girls and boys, respectively), T3 ($N_s = 94$ and 117 , $M_s = 4.01$ and 3.58 , $SD_s = 1.20$ and 1.09 , for girls and boys, respectively), and T4 ($N_s = 84$ and 102 , $M_s = 3.77$ and 3.44 , $SD_s = 1.31$ and 1.01 , for girls and boys, respectively), $t_s(212, 209, 184) = -2.41, -2.69, \text{ and } -1.98, p_s < .05$, at T2, T3 and T4, respectively. Girls also had higher mother-reported sadness than boys at T3 ($N_s = 89$ and 106 , $M_s = 4.03$ and 3.64 , $SD_s = .68$ and $.73$, for girls and boys, respectively) and T4 ($N_s = 81$ and 101 , $M_s = 4.11$ and 3.71 , $SD_s = .70$ and $.75$, for girls and boys, respectively), $t_s(193, 180) = -3.86$ and $-3.73, p_s < .01$, at T3 and T4, respectively.

With respect to emotion perception variables, girls had higher overall emotion perception accuracy than did boys ($N_s = 96$ and 116 , $M_s = .15$ and $.10$, $SD_s = .20$ and $.18$, for girls and boys, respectively) at T2, $t(210) = -2.34, p < .05$,

and more accurately identified sadness at T3 than boys ($Ns = 87$ and 100 , $Ms = .59$ and $.46$, $SDs = .37$ and $.40$, for girls and boys, respectively), $t(185) = -2.38$, $p < .05$. Girls also had higher expressive language than boys at T2 ($Ns = 97$ and 117 , $Ms = 77.66$ and 69.55 , $SDs = 25.15$ and 19.36 , for girls and boys, respectively) and T4 ($Ns = 77$ and 86 , $Ms = 12.03$ and 10.87 , $SDs = 3.56$ and 3.24 , for girls and boys, respectively), $ts(212, 161) = -2.58$ and -2.17 , $ps < .05$, at T2 and T4, respectively.

Correlations with Child's Age and Family Socioeconomic Status (SES)

The concurrent correlations among the study variables at each time with child's age at the time of each lab visit, and family SES (collected at T2) were performed. No significant correlations between the study variables at each time point and child's age at the time of lab visit were found.

Parents' punitive and minimizing reactions at T2 and T3 were negatively related to SES, $rs(213) = -.33$ and $-.32$, $ps < .01$ at T2, $rs(187) = -.31$ and $.30$, $ps < .01$ at T3, respectively. Caregiver-reported anger and sadness expressions at T2 and mother-reported anger and sadness expressions at T3 were negatively related to SES, $rs(141, 144) = -.17$ and $-.19$, $ps < .05$ for T2 anger and sadness expressions, respectively and $rs(196, 195) = -.20$ and $-.15$, $ps < .05$ for T3 anger and sadness expressions, respectively. Children's emotion perception accuracy at T2, T3 and T4 were positively related to SES, $rs(210, 187, 170) = .17$, $.32$, and $.21$. $ps < .05$, for T2, T3 and T4, respectively. In terms of emotion perception bias variables, T3 anger bias was negatively related to SES, $r(187) = -.16$, $p < .05$, and T3 sadness bias was positively related to SES, $r(187) = .21$, $p < .01$.

Correlations with Expressive Language

The correlations between children's expressive language and study variables also were examined both within- and across- time. Recall that T4 emotion perception bias and T3 fear perception bias were categorical variables. In terms of within-time correlations at T2, only mothers' distress reaction was negatively related with expressive language, $r(219) = -.14, p < .05$. At T3, caregivers' reports of children's anger expressions were positively related to expressive language, and anger and fear bias were negatively related to expressive language, $r_s(138, 192 \text{ and } 192) = .20, -.21 \text{ and } -.18, p_s < .05$, respectively. At T4, mothers' and caregivers' reports of anger, and anger and sad bias were negatively related to expressive language, $r_s(165, 127, 167 \text{ and } 167) = -.22, -.20, -.21 \text{ and } .26$, $p_s < .05$, respectively, whereas children's accurate identification of negative emotions were positively related to concurrent language, $r_s(167) = .35, .37, .35$, and $.43, p_s < .01$, for anger, sad, fear accuracy and EPA, respectively.

In terms of longitudinal relations, T2 caregiver-reported fear was negatively related to T3 expressive language, $r(110) = -.20, p < .01$, and T2 anger, sad and fear accuracy, overall EPA, and fear bias were positively related to T4 expressive language, $r_s(167, 167, 167, 167, 166) = .20, .16, .28, .26 \text{ and } .25, p_s < .01$, respectively. In addition, T3 anger, sad and fear accuracy, and overall EPA were positively related to and fear bias was negatively related to T4 expressive language, $r_s(166) = .21, .33, .25, .31 \text{ and } -.16, p_s < .01$, for anger, sad, and fear accuracy, overall EPA and fear bias, respectively.

Attrition

To examine the attrition effects, first the sample at the first lab assessment at 18 months (T1) was compared to the sample at T2 on demographic variables and then the sample at T2 was compared with the samples at T3, T4 and T5 on the demographic and study variables (using *t*-tests and chi-square statistics). The demographic variables that were included in the attrition analyses were parents' marital status (1 = married and 2 = single), children's ethnicity, race (1 = Caucasians and 2 = Minorities) and sex (using chi-square statistic), SES, mothers' and fathers' age at the time of childbirth, and children's age (using *t*-tests).

The sample at T1 also was compared to the sample at T2 in terms of demographic variables. Children who participated in the study at T1, but not at T2, were older at the time of T1 lab visit ($N = 27$, $M = 18.08$) and were from families with lower SES ($N = 27$, $M = -.37$) than those who participated at both T1 and T2 ($Ns = 220$ and 216 , $Ms = 17.75$ and $.04$), $t(245,241) = -3.19$ and 2.35 , $ps < .05$, for age at the time of 18-month lab visit and family SES, respectively. No other significant differences were observed.

There were no significant differences in terms of study or demographic variables between families who attrited from T2 to T3 and families who participated in the study at both time points. Families who attrited from T2 to T4 were also compared to families who participated in the study on the study and demographic variables. The attrition analyses revealed that mothers who participated at both time points were older ($N = 201$, $M = 29.76$) than mothers who attrited from T2 to T4 ($N = 36$, $M = 27.44$), $t(235) = 2.35$, $p < .05$.

The sample at T2 also was compared to the sample at T5 in terms of demographic and study variables. Mothers who participated in the study at T2, but not at T5, were younger at the time of childbirth ($n = 36$, $M = 27.44$) than mothers who participated at both T2 and T4 ($N = 201$, $M = 29.76$), $t(235) = 2.35$, $p < .05$. Children who were lost due to attrition from T2 to T5 had lower levels of caregiver-reported anger ($N = 29$, $M = 2.60$) than children who participated in the study at both time points ($N = 116$, $M = 3.12$), $t(143) = 2.66$, $p < .01$. Children who participated in the study at T2, but not at T5, also were older at the time of T2 lab visit ($N = 53$, $M = 29.96$) than those who participated at both T2 and T5 ($N = 163$, $M = 29.71$), $t(214) = -2.43$, $p < .05$.

Relations of Measures Within Time

The relations between study variables within-time are presented in Tables 2-4. At T2, mothers' negative-dominant and –submissive expressivity, and mothers' reports of punitive and distress reactions were positively correlated with mothers' reports of children's proneness to anger and sadness. Mothers' submissive expressivity and punitive reactions also were positively related to caregivers' reports of children's proneness to anger (see Table 2). None of the indicators of negative emotionality and parenting was related to emotion perception accuracy and bias variables with the exception of negative correlation between mother-reported anger and children's anger bias, $r(210) = -.15$, $p < .05$, and positive correlation between negative-submissive expressivity and children's overall emotion perception accuracy (see Table 2). In terms of correlations

between emotion perception accuracy and bias variables, emotion perception accuracy was positively related to anger and sad bias, $r_s(216) = .25$ and $.23$, $p_s < .01$, for anger and sad bias, respectively.

At T3, mothers' negative-dominant and submissive expressivities were positively related to children's expressions of anger as reported by mothers; mothers' negative-submissive expressivity also positively correlated with children's expression of sadness. With the exception of the correlation between mothers' punitive reactions and caregivers' reports of children's fear expressions, mothers' punitive and distress reactions positively correlated with mothers' and caregivers' reports of expressions of distinct negative emotions (see Table 3). In terms of associations of parenting and children's negative emotionality to emotion perception variables, only parents' punitive and minimizing reactions were negatively related to children's overall emotion perception accuracy (see Table 3). In addition, emotion perception accuracy was negatively related to anger and sad bias, $r_s(192) = -.17$ and $-.16$, $p_s < .05$, for anger and sad bias, respectively.

All the correlations between parenting variables and mothers' reports of children's anger and sadness expressions at T4 were positive and significant with the exceptions of associations of parents' negative-dominant expressivity and anger and sadness expressions, and the correlation between distress reaction and mother-reported fear. Mothers' submissive expressivity also was positively related to caregiver-reported fear (see Table 4). None of the parenting variables and children's expressions of distinct negative emotions was related to emotion perception variables with only one exception. Caregiver-reported fear was

positively related to anger bias, $r(121) = .25, p < .01$. In terms of correlations between emotion perception variables, emotion perception accuracy was negatively related to anger and sad bias, $r_s(174) = -.28$ and $-.43, p_s < .01$, for anger and sad bias, respectively.

In summary, with a few exceptions, parenting was positively correlated with mothers' and caregivers' reports of children's anger and sadness expression within time. In addition, emotion perception accuracy and bias variables, for the most part, were negatively related to each other. Inconsistent with the hypotheses, the indicators of parenting and children's negative emotionality were not related to emotion perception variables.

Stability of Measures

Stability of parenting variables. The indicators of mothers' negative emotional expressivity (negative-dominant and –submissive expressivity) and non-supportive reactions were stable across time (see Table 6). Overall, the correlations between identical negative expressivity (e.g., correlations between negative dominant expressivity across time) were greater than correlations between non-identical expressivity variables (e.g., correlations between negative-dominant and negative-submissive expressivity across time). Parents' reports of non-supportive reactions and negative expressivity also tended to be positively correlated across time with the exception of T2 and T3 negative-expressivity (dominant and submissive expressivity) to T3 mothers' negative reactions, and T2 and T3 negative-submissive expressivity to T3 and T4 mothers' negative reactions (see Table 6).

Stability of children's proneness to distinct negative emotions. As can be viewed in Table 6, children's expressions of anger, sadness and fear were stable across time (the averaged mothers' and teachers' reports of distinct negative emotions) indicating that children who expressed higher levels of anger, sadness, and fear at T2 also expressed high levels of anger, sadness and fear, respectively, at T3 and T4 (see Table 6). For example, children who displayed higher levels of sadness at T2 also expressed higher levels of anger and fear at T2 and T3. In addition, children's expressions of distinct negative emotions were correlated with each other at each time point. Correlations ranged from .33 to .62 at T2, .25 to .62 at T3 and .22 to .52 at T4.

Stability of emotion perception variables. The emotion perception accuracy variables also tended to be stable over time (see Table 6); however, there was no stability in the emotion perception bias variables across time. In terms of relations between emotion perception accuracy and emotion perception bias variables, T2 emotion perception accuracy was negatively related to T3 anger bias, $r(190) = -.23, p < .01$, indicating that children who scored lower in accurate identification of emotions at T2 displayed lower anger bias at T3. In addition, T3 emotion perception accuracy was negatively related to T4 anger and sad perception bias, $r_s(172) = -.19$ and $-.26, p_s < .05$, for anger and sad bias, respectively. Given that anger and sadness bias were categorical variables, these results indicated that children with relatively high emotion perception accuracy displayed less bias toward anger and sadness.

Preliminary Analyses

To examine the specific hypotheses of the current study, the correlations among the variables involved in each hypothesis were examined. Next, the main hypotheses were tested using structure equation modeling (SEM). Lastly, the quadratic relations between parenting and emotion perception variables were tested using regression analyses.

Correlations

Correlations between parenting variables and emotion perception variables. The correlations between parenting variables and children's emotion perception accuracy and bias variables across time were mostly weak and non-significant; however, one exception was observed. Parents who expressed higher levels of non-supportive reactions at T2 had children who less accurately identified negative emotions at T3 (see Table 6).

Correlations between children's negative emotionality and emotion perception variables. Children's expressions of distinct negative emotions were not related to children's overall EPA or emotion perception biases across time¹.

Correlations between emotion perception accuracy/bias and conduct disorder. Only T3 emotion perception accuracy was negatively related to children's conduct disorders (average of mothers' and caregivers' reports) at T5, $r(147) = -.24, p < .01$. None of the emotion perception bias variables at earlier time points was correlated with children's conduct disorder symptoms at T5¹.

Correlations between parenting, negative emotions and conduct disorder. The correlations between parenting variables and children's expressions

of anger and sadness were mostly positive and significant with two exceptions: 1) correlations between T2 and T3 negative-dominant expressivity and sadness, and 2) relations between T2 and T3 negative-submissive expressivity and T4 anger expression (Table 6). In addition, mothers' negative-submissive at T2 was positively related to children's fear expressions at T4, and mothers' non-supportive reaction at T2 was positively and significantly correlated with T3 fear.

With respect to children's conduct disorders, only T2 mothers' non-supportive reactions, T3 mothers' negative-dominant expressivity and T4 children's anger expressions was positively correlated with T5 children's conduct disorder, $r_s(153, 154 \text{ and } 154) = .17, .17, \text{ and } .56, p_s < .05$, respectively.

Structural Equation Modeling

To test the hypotheses of the current study, two structural equation models were run using *Mplus* 6.0 (Muthén, & Muthén, 1998-2010) that can appropriately handle missing data assuming that the data are *missing at random* (MAR). In each structural equation model, the measurement errors of the indicators of identical reporters were correlated with each other (Kenny & Kashy, 1992) as guided by modification indices. Before testing the predictions, measurement models were conducted to test the unidimensionality of the latent constructs (i.e., children's negative emotionality and parenting) and the invariance of factor loadings across time and variances of all indicators of latent constructs were examined. The fit indices used as the indicators of the model fit included CFI (values greater than .95 show good fit), RMSEA (values less than .05 indicate that model fit the data

well), and the chi-square statistic (non-significant chi-squares indicate good fit). All the models presented in the following sections converged with no errors.

Confirmatory factor analysis. Two confirmatory factor analyses (CFA) with the full information maximum likelihood (FIML) estimation were conducted to examine whether the indicators loaded on related constructs at each time point and to test the invariance of factor loadings and variances of the indicators across time. Only the final models with constrained factor loadings and unique variances are presented (see Figures 4 and 5).

First, two separate CFA models were run to confirm the relation between the observed variables and their respective latent constructs. The preliminary analyses revealed two final latent constructs to be used in further analyses at each time point: parenting and children's negative emotionality. Parenting was indicated by mothers' reports of negative-dominant and –submissive expressivity and non-supportive reactions to children's negative emotions (i.e., three indicators at each age). The construct of negative emotionality was indicated by children's anger, sadness and fear expressions, specified by the average of mothers' and caregivers' reports (i.e., three indicators at each age). Separate CFA models were run for parenting and negative emotionality because the high correlations between the indicators of the two latent constructs resulted in a poor-fitting model when the parenting and negative emotionality constructs were included in the same CFA model. Moreover, when they were included in the same SEM models, there were problems with convergence; thus, separate models of parenting and negative emotionality were computed.

The first CFA model was conducted to examine whether the indicators of parenting significantly loaded on the parenting latent construct at the three ages. The residual variances of negative-dominant, negative–submissive expressivity and non-supportive reactions across time were correlated as suggested by modification indices. All the indicators of parenting significantly loaded on the relevant latent construct, and the resulting model fit the data well, $\chi^2(7) = 5.07$, $p = .65$, CFI = 1.00, RMSEA = .00. The second CFA model was performed to test whether the indicators of children’s anger, sadness and fear significantly related to the negative emotionality latent construct at the three ages. The unique variances of children’s expressions of anger, sadness and fear were correlated across time. All the factor loadings were significant, and the resulting model fit the data well, $\chi^2(14) = 9.33$, $p = .81$, CFI = 1.00, RMSEA = .00.

To ensure that the factors loadings of all indicators of the latent constructs could be constrained across time, the longitudinal invariance of the aforementioned models were examined. First, all the factor loadings of identical indicators of parenting and negative emotionality were constrained to be equal across the three time points in each model (the parenting model and the negative emotionality model). The resulting models fit the data well, χ^2 s(11, 18) = 6.97 and 11.50, $ps = .80$ and $.87$, CFIs = 1.00 and 1.00, and RMSEAs = .00 and .00 for parenting and negative emotionality models, respectively. The constrained models were compared to the unconstrained models (the first and second CFA models, see above) using the chi-square difference test, $\Delta\chi^2$ s(4, 4) = 1.90 and 2.17, $ps = ns$, for the parenting and negative emotionality models, respectively. These results

demonstrated that the complete invariance of the factor loadings existed across time for both models.

Next, the unique variances of all indicators of the latent constructs were constrained across time along with the factor loading in the two models. The resulting models fit the data moderately well, χ^2 s(17, 24) = 25.21 and 26.32, $ps = .09$ and $.34$, CFIs = $.99$ and 1.0 , and RMSEAs = $.04$ and $.02$, for parenting and negative emotionality, respectively. These constrained models were compared to the previous model using the chi-square difference test, $\Delta\chi^2$ s(6, 17) = 18.24 and 14.82, $ps < .01$, for parenting and negative emotionality, respectively. These results suggested that the unique variances of all the indicators were not invariant across time. Thus, the constraints of the variances of the indicators were removed one at the time. For each model, if the constraint removal significantly improved the fit (indicated by the chi-square difference test), the constraint was removed.

In the parenting model, only the unique variance of T4 mothers' non-supportive reactions was set to be freely estimated, whereas the unique variances of the other parenting indicators were constrained to be equal across time, $\Delta\chi^2(5) = 4.16$, $p = ns$. In terms of the negative emotionality model, the variance of children's anger was set to be freely estimated across time $\Delta\chi^2(4) = 2.91$, $p = ns$. The resulting models (see Figures 4 and 5) fit the data moderately well, χ^2 s(16, 22) = 11.13 and 14.41, $ps = .80$ and $.89$, CFIs = 1.00 and 1.00 , RMSEAs = $.00$ and $.00$, for parenting and negative emotionality models, respectively.

Models related to the hypotheses. Two SEM models were computed (See Figures 2 and 3) to test the study's hypotheses; recall that four of the bias

variables in the models were categorical. However, the attempts made to run the models with both categorical and continuous variables were not successful². Thus, the four categorical variables were excluded from the models and the models were revised. The final bias variables that were included in testing the study hypotheses were T2 emotion perception bias variables, and T3 anger and sad bias (see Figures 6 and 7 for revised models). Full information maximum Likelihood (FIML) estimation was used for computing the two revised SEM models. In addition, for both models, tests of mediations were performed using the bootstrapping procedure with 5000 bootstrap resamples and 10000 iterations. The bootstrapping approach was used because it does not assume that the parameter estimates are normally distributed and thus it would provide more reliable parameter estimates (Preacher & Hayes, 2008). The models presented in the following section converged with no errors.

Testing the mediating role of emotion perception variables in the relation between parenting and disruptive behaviors. The first revised hypothesized model (see Figure 6) was tested using a SEM model. In this revised model, parents' negative dominant- and submissive expressivity, and parents' non-supportive reactions at T2 and T3 were expected to negatively relate to children's emotion perception accuracy at T3 and T4, and to positively relate to children's emotion perception bias at T3, after controlling for stability of the emotion perception variables over time. The relations between parenting variables and children's disruptive behaviors in turn were predicted to be mediated through high emotion perception accuracy and low emotion perception bias. The SEM model

included the parenting variables, the emotion perception accuracy and bias variables, and disruptive behaviors. Children's expressive language at T2, T3 and T4 was used as control variable on the concurrent emotion perception accuracy and bias variables. Because the emotion perception accuracy and bias variables were proportion scores (ranged from 0 to 1), the language variables (ranged between 0 and 100) were divided by 100 so that they would be on the same scale as emotion accuracy and bias variables. Direct paths included from T2 parenting to emotion perception accuracy and bias variables, T3 parenting to T4 emotion perception accuracy, and from T4 emotion perception accuracy and T3 emotion perception bias variables to T5 disruptive behaviors (see Figure 6). The correlated errors of all indicators of parenting within and across time were added to the model as suggested by modification indices. The values of CFI and chi-square of the resulting model demonstrated an adequate fit with the exception of chi-square statistics, $CFI = .94$, $RMSEA = .05$, $\chi^2(153) = 235.28$, $p < .01$. Examination of the standardized residuals, which are the differences between model-implied and observed covariances, indicated that the covariances of the fitted model may not represent the sample covariances; thus, the model needed to be respecified (Kline, 2011).

Because the chi square of the model indicated non-optimal fit, the model was respecified as suggested by modification indices. These paths were added only if they were theoretically meaningful. Three paths were subsequently added, including the path from T2 emotion perception accuracy to T3 anger bias and from T2 and T3 emotion perception accuracy to T4 language. In addition, to

improve the fit, some non-significant paths were removed from the model including the autoregressive paths for the bias variables and the non-significant within-time correlations between parenting and emotion perception variables and between emotion perception variables and language (see Figure 7 for non-significant paths and unspecified significant paths). The resulting model fit the data well, CFI = .98, RMSEA = .03, $\chi^2(139) = 165.27, p = .06$, (see Figure 8).

Consistent with the correlations, none of the hypotheses related to Figure 6 was supported. In terms of within-time correlations, T2 emotion perception accuracy was positively related to T2 sad and anger bias, whereas T3 emotion perception accuracy was negatively related to concurrent sad bias. These results, although unexpected, were consistent with within-time correlations.

Testing the mediating role of emotion perception variables in the relation of negative emotionality to disruptive behaviors. Children's negative emotionality was expected to be positively related to children's emotion perception bias and expected to be negatively related to children's emotion perception accuracy. Furthermore, it was expected that the relation between T2 and T3 children's negative emotionality and T5 disruptive behaviors would be mediated through T3 and T4 emotion perception accuracy and T3 anger and sadness perception bias (see Figure 7 for the revised model). A SEM model was conducted that included children's negative emotionality, emotion perception accuracy and bias variables, and disruptive behaviors. Children's expressive language at T2, T3 and T4 were used as control variables on the concurrent emotion perception accuracy and bias variables. Direct paths in the SEM model

were included from T2 children's negative emotionality to T3 emotion perception accuracy and bias variables, from T3 children's negative emotionality to T4 emotion perception accuracy variables, and from T4 emotion perception accuracy and T3 bias variables to T5 disruptive behaviors (see Figure 7). The correlated errors of children's distinct negative emotions across time were added to the model as suggested by modification indices. In addition, T2 fear perception bias was excluded from the model because 1) there was no relation between T2 fear bias and any other study variable, and 2) other fear bias variables were excluded from analysis due to the violation of normality assumption. The resulting model appeared to have inadequate fit as indicated by the values of CFI and chi-square fit indices, $\chi^2(152) = 254.61, p < .01, CFI = .91, RMSEA = .05$. To improve the fit of model, the unspecified significant paths that were suggested by the modification indices and were theoretically and statistically acceptable were added to the model. These paths included the direct paths from T2 and T3 emotion perception accuracy variables to T5 expressive language and from T2 emotion perception accuracy to T3 anger bias. In addition to adding these paths, the non-significant paths that were not related to the hypotheses of the study were excluded from the model. However, the fit of the model did not improve with these new respecifications, $\chi^2(158) = 231.64, p < .01, CFI = .94, RMSEA = .05$, and examining the standardized residuals (z-score) for covariances demonstrated that the model-implied covariances may not match the sample covariances. The modification indices were examined for improvement of model fit; the large modification indices belonged to the covariances between the measurement errors

of children's earlier levels of aggressive behaviors and indicators of children's negative emotionality. These correlated measurement errors could not be incorporated into the model and no other attempts to respecify the model resulted in fit improvement. Thus, children's earlier level of aggressive behavior was removed from the model. Removing the earlier levels of aggressive behaviors from the model resulted in a well-fitting model as indicated by all modification indices, $\chi^2(131) = 155.04, p = .07, CFI = .98, RMSEA = .03$. It should be noted that the unspecified significant paths were included in the model for the fit improvement but the non-significant paths were not deleted because removing these paths did not have a substantial effect on the fit improvement (see Figure 9).

Consistent with the over-time correlations, none of the hypothesized paths or correlations was significant. In term of within-time correlations, T3 negative emotionality was positively related to concurrent anger bias. This result indicated that children with high proneness to negative emotionality at T3 displayed higher concurrent anger bias. In addition, T2 emotion perception accuracy was positively related to T2 anger and sad bias, whereas T3 emotion perception accuracy was negatively and significantly related to sad bias and anger bias. These latter results were consistent with within-time correlations. In terms of relations between language (control variable) and emotion perception variables, T2 and T4 emotion perception accuracy were positively related and T3 anger bias was negatively related to children's concurrent expressive language. In addition, children's T4 language was positively predicted by children's emotion perception accuracy at T2 and T3.

In summary, none of the expected direct paths or indirect paths was supported. In both parenting and negative emotionality models, children's T4 expressive language was predicted by earlier emotion perception accuracy indicating that children who accurately identified negative emotions at earlier time points had relatively high language abilities at later time points. Children's emotion perception accuracy and bias variables, for the most part, were related to each other in the expected direction with only one exception. That is, the aforementioned variables were positively related to each other when children were 30 months of age.

Quadratic Relation Between Parenting and Emotion Perception Variables

In addition to testing the direct paths between parenting and emotion perception variables, the quadratic relations of mothers' negative-dominant and –submissive expressivity to emotion perception variables were also examined. It was expected that low and moderate levels of mothers' negative- dominant and -submissive expressivity is unrelated to emotion perception accuracy and bias variables, whereas mothers' high negative expressivity is negatively related to emotion perception accuracy and positively related to emotion perception bias variables.

To examine the quadratic relations, the quadratic terms of negative-dominant and –submissive expressivity were formed by squaring each type of negative expressivity. Next regression analyses were conducted to examine whether there is a quadratic relation between parents' negative expressivity and emotion perception variables. A total of 10 regression analyses were conducted to

examine 1) the relations between T2 mothers' negative expressivity to T3 emotion perception accuracy and bias variables (8 regressions; 2 types of negative expressivity X 4 emotion perception variables), and 2) T3 mothers' negative expressivity to T4 emotion perception accuracy (2 types of negative expressivity X 1 emotion perception accuracy). In each regression, mothers' negative-dominant or -submissive expressivity term was entered on the same step as the quadratic term; children's earlier levels of aggression and concurrent language were entered as control variables. No significant quadratic effects were found for parents' negative expressivity.

Discussion

It has been suggested that emotion understanding does not only encompass the accurate identification of emotions (emotion perception accuracy; EPA) but also includes children's bias toward different emotions (emotion perception bias; EPB). In addition, the results of recent studies that have been conducted using the two separate components of emotion understanding, EPA and EPB, have shown that these two distinct processes may differentially relate to children's outcomes, including aggressive behaviors (Fine et al., 2004; Martin et al., 2009). The goal of the current study was to examine whether negative parenting practices and children's negative emotionality differentially related to children's emotion perception accuracy and bias over time, and whether children's emotion perception variables differentially related to children's later conduct disorder in a sample of young children from 24 to 72 months of age. Moreover, it was predicted that emotion perception accuracy and bias would mediate the

associations of parenting and children's negative emotionality to children's later disruptive behaviors. The results did not support any of the longitudinal predictions; however, a few significant within-time correlations were observed.

T3 children's proneness to negative emotions was positively related to concurrent children's anger bias. This result was consistent with previous research suggesting that the experience of negative emotions may positively relate to children's bias toward negative emotions (e.g., Schultz et al., 2004). For example, Schultz et al., (2004) found that children's anger and fear expressions were positively related to anger and fear perception bias. However, these researchers found no association between children's sadness expressions and sad perception bias. Instead, children's sad expressions were positively related to anger perception bias. Thus, children's negative emotionality, in general, seemed to predict anger perception bias. The findings of the current study concur with these results in that T3 negative emotionality was related to anger bias but was unrelated to sad bias at T3. It should be mentioned, however, that children's proneness to negative emotionality did not relate to anger bias at T2. The lack of findings for within-time associations between aforementioned variables at T2 could be due to children's understanding of distinct negative emotions at various developmental stages. Research evidence has shown that identification of anger and fear is more difficult--with fear being the most difficult emotion to recognize-- than identification of happiness and sadness for children between ages of 2 and 4 years (Denham & Couchoud, 1990). Thus, at 30 months of ages children may

have not yet acquired understanding of anger in order to display anger perception bias.

Although not the focus of this study, the stability and consistency of study variables were also examined. In the current study, children's emotion perception accuracy was found to be stable over time. This result suggested that, on average, children who were skilled in identification of negative emotions in different situations at 30 months of age also tended to have high overall emotion perception accuracy at 42 and 54 months of age. Given that accurate identification of emotions in different situations has been found to be related to positive social outcomes including better social relationships and academic achievement during school years (Izard et al., 2001; Pons, et al., 2003), this finding emphasized the importance of increasing children's knowledge of different emotions during early years. In addition to children's emotion perception variables, parenting practices and children's negative emotionality also tended to be stable over time, which replicated what has been observed by other researchers (Eisenberg et al., 2005; McNally, Eisenberg, & Harris, 1991).

In the current study, children's expressive language was controlled because previous research has shown that children's cognitive abilities including children's expressive and receptive language abilities may positively predict children's emotion understanding (Brown & Dunn, 1996; Fine et al., 2003). The results of this study illustrated the same pattern as a positive relation was found between children's accurate identification of emotions and expressive language within time. In addition, children's expressive language at T5 was found to be

predicted by earlier children's emotion perception accuracy; children who had higher emotion perception accuracy at T3 and T4 had better language abilities at 72 months of age. Although not tested in the current investigation, perhaps emotion perception accuracy predicts children's language abilities through their social interactions with others. That is, children who are better at understanding others' expressed emotions have been found to also be more socially competent and have higher peer likeability than children with poor emotion knowledge (Denham et al., 2003; Garner et al., 1994). In turn, social interaction and engagement with others may be responsible for language learning and improvement (Bloom, 1993). Indeed, previous researchers have found that children's emotion knowledge was a significant predictor of social and academic competence, especially among economically disadvantaged children. In the current study the relation between emotion knowledge and language ability was tested among children from middle income families. The bidirectional relation between language and emotion knowledge found in this study once more emphasized the importance of improving children's emotion knowledge during the early years, which may have implications for children's future language development and academic achievement.

Emotion perception bias variables and emotion perception accuracy, for the most part, were negatively related to each other within and across time. T3 emotion perception accuracy was negatively related to concurrent sad and anger bias. In addition, children who had higher emotion perception accuracy at T2 displayed lower bias toward anger at T3. The negative relation between emotion

perception accuracy and bias variables was expected and consistent with the results found by previous researchers (e.g., Fine et al., 2004), indicating that these two components of children's emotion knowledge are related. However, one exception was found; the direction of associations between emotion perception accuracy and bias variables at T2 was the opposite of what was expected. T2 emotion perception accuracy was positively related to concurrent anger and sad bias. Although it cannot be certainly stated, this unexpected relation could be due to children's lower ability to recognize fear than anger and sadness at 30 months of age. Denham and Couchoud (1990) found that understanding fear in situations may be more difficult than other negative emotions for children between the ages of 2 and 4 years. Indeed in the current study, children in the sample displayed lower fear perception accuracy at T2 than at T3 and T4. 177 children out of 216 could not identify any of the fear situations at T2 (81.94%) as compared to only 50 out of 192 children at T3 (26.04%) and 33 out of 178 children at T4 (18.54%). By looking at individual scores, it could be seen that in most cases fear was identified as another negative emotion (anger or sadness), which could explain why children's score for anger and sad bias were higher at T2 than T3 and T4. Another possible explanation for why children could not identify fear at 30 months of ages may be the use of puppets rather than photographs of facial emotional expressions that were used at later time points. Indeed, the puppets' fear faces may have been resembled angry and sad faces, which may have been responsible for children's over identification of angry and sad faces.

Despite expectation, neither parenting nor children's negative emotionality predicted children's emotion perception bias and accuracy over time. Children's earlier emotion perception accuracy and bias were also unrelated to later disruptive behaviors. Previous researchers have found that emotion perception accuracy and bias, although related, were two distinct components of children's emotion knowledge because they uniquely and differentially predicted children's outcomes (Fine et al., 2004; e.g., Martin et al., 2009). In the current study, no support was found for the distinctiveness of emotion perception accuracy and bias as they were unrelated to the predictors and outcome. However, it should be noted that the lack of findings for the longitudinal associations could be due to a number of factors including the inappropriateness of measures to assess children's emotion perception accuracy and bias given the limitations of the sample, focusing on the parenting variables that were not predictive of children's emotion perception processes and only relying on mothers' reports. Thus, the distinctiveness of two components of emotion understanding found in previous studies cannot be firmly rejected based on the current study's results.

A number of factors may explain the lack of findings for the hypothesized associations in the current study. First, the measures used in the current study may have been problematic and inadequate especially given the population of this study. In the current study, only the stereotypical situations portion of emotion understanding task was used for the calculation of emotion perception accuracy and bias, which resulted in low frequency of bias and accuracy variables. Although the same measure and technique often has been utilized by other

researchers to measure children's emotion perception accuracy and bias, the sample used in this study was quite different from samples used by previous researchers. The relation between emotion perception accuracy and bias to outcomes often has been examined among at-risk children (e.g., children with conduct disorder problems; children from low income families; Fine et al., 2004; Martin et al., 2009) who have been reported to display more biases than typically developing children with better environmental factors. Previous research has shown that environmental factors such as low family SES, single parent status, low parental education and maternal depression are predictive of children's maladaptive information processing and high emotion perception bias (e.g., Schultz & Shaw, 2003). The children who participated in the current study were relatively low risk, , and thus, few children in the study displayed emotion biases at a high frequency. These results suggest two potential explanations: either the above-mentioned measure was not appropriate for detecting children's emotion biases in low-risk samples, or the emotion perception biases do not frequently occur among low-risk children.

Second, unlike other studies that have focused on poor environmental factors (e.g., family instability) or implicit negative parenting practices that may expose children to negative emotions (e.g., maternal depression), the focus of the current study was on more explicit negative parenting practices characterized by negative affect expressivity. However, no significant result was found for the association between parenting practices and emotion perception variables over time. Thus, it is likely that the two measures of parenting used in this study were

not as predictive of children's emotion perception accuracy and bias as underprivileged environmental conditions or negative parenting practices that put children at risk for experiencing extreme negative emotions (i.e., maternal depression, abusive parenting). Previous research studies have shown that negative parenting practices are less common among parents with higher education and income (Hoff, Laursen, & Tardif, 2002). Given that the families who participated in this study were mostly middle-class families, it is also possible that the mothers in this study did not display high levels of negative emotional expressivity. In addition, it is likely that the moderate or low levels of parents' expressions of negative affect are not as predictive of children's maladaptive information processing practices such as harsh discipline. Because Extreme negative parenting practices such as use of corporal punishment may more strongly predict children's biases toward negative emotions than moderate levels of negative expressivity because these types of parenting practices are often accompanied with extreme levels of negative emotional expressivity. Indeed, some researchers have argued that exposure to low or moderate levels of negative expressivity within the home environment may be beneficial for children's understanding of negative emotions (Halberstadt et al., 1999). Thus, emotional expressivity may be particularly problematic only under conditions of harsh discipline or low levels of warmth.

As mentioned above, most of previous research examining the associations between children's exposure to negative affect within the home environment and maladaptive information processing has been conducted among

at-risk populations who lived under extreme circumstances (e.g., maltreated children). The premise of this line of research is that children's exposure to extreme negative affect within the home environment may lead to formation of negative mental schemas about emotions, which in turn may contribute to children's encoding and retrieval of information about emotional stimuli (e.g., facial emotional expressions). Indeed, the formation of maladaptive processing of emotional stimuli has been argued to be dependent on the history of emotional exchanges between children and their caregivers and the mental schemas that children create over time as the result of interactions with their caregivers (Pollak, Cicchetti, Hounung, & Reed, 2000; Pollak & Pawan, 2002). It should be mentioned that the same theory may not be applied to explain how children's exposure to mild or moderate levels of negative affect within the home environment may relate to maladaptive information processing because of the existence of more complex relations in creating emotion-related mental schemas (e.g., interactions between parents' negative expressivity and child's proneness to negative emotions). It is also possible that for children who are exposed to mild or moderate levels of negative affect under non-extreme circumstances, the formation of maladaptive emotion-related mental schemas occurs later in life because the mental schemas may develop with a slower rate among the aforementioned population than among children who live under extreme circumstances. Thus, more longitudinal research needs to be conducted among low-risk populations, which may contribute to development of more complex

theory or the refinement of existing theory regarding children's exposure to negative affect and maladaptive information processing.

Another important direction for future research is to examine how children's exposure to distinct negative emotions (e.g., anger, sadness) may differentially relate to children's bias toward those specific types of emotions. Because of high correlations between mothers' expressions of distinct types of negative emotions (e.g., negative-dominant and negative-submissive), the variables were used as indicators of mothers' negative affect expressivity construct in the current study. However, it should be mentioned that previous research suggests that children's experience of specific negative emotions may differentially relate to children's bias toward distinct negative emotions (Schultz et al., 2004). For example, children's exposure to high levels of anger may positively relate to children's bias toward anger but may be unrelated to children's bias toward fear. Thus, future research conducted among non-extreme and low risk populations needs to examine how exposure to specific types of negative emotions may relate to children's bias toward those emotions.

Another issue deserving of consideration is that children's temperamental negative emotionality was assessed using mothers' and caregivers' reports, which has potential for bias (Bishop, Spence, & McDonald, 2003; Seifer, Sameroff, Barrette, & Krafchuk, 1994). Thus, future research studies may need to examine how observed measures of children's proneness to negative emotions may relate to children's emotion perception processes. Another possible explanation for lack of findings for the association between children's negative emotionality and

emotion perception variables could be that children's proneness to negative emotions may not be disruptive of children's maladaptive information processing if children are able to regulate their negative emotions. Indeed, previous research have shown that children with low regulation skills may be at higher risk for expressing maladaptive information processing than children with low emotion regulation skills (Eisenberg & Fabes, 1992; Frick & Morris, 2004). Thus, more research needs to be done to examine the relation between emotion regulation and emotion perception variables to examine whether children's emotion regulation abilities, and particularly in interaction with proneness to negative emotions, relate to children's emotion perception process.

In addition to the limitations of the sample and measures, in the current study, only mothers', and not other family members', negative parenting practices were used as a potential predictor of children's emotion perception accuracy and bias. Because families are the first contexts in which children are exposed to different types of emotions, it was predicted that children who are exposed to high and intense negative emotional expressions within the family environment may be at high risk for displaying maladaptive information processing and negative emotion biases. The environment in which children are embedded in may compromise of many people (e.g., mother, father, siblings) who may individually contribute to children's information processing patterns including children's perceptions of distinct emotions. Thus, relying solely on mothers' negative affect expressivity patterns only provides a small portion of family's negative expressivity style and may overlook the influences that other family members

may have on children's emotion understanding. Thus, the emotional exchanges and processes between children and other family members in children's immediate environment (e.g., fathers, grandparents, and siblings) need to be taken into account by future researchers.

Lastly, the present study aimed to examine the early predictors of emotion perception accuracy and bias as well as the associations of these variables to disruptive behaviors during toddler years. Thus, children's emotion perception bias and accuracy were assessed between ages of 30 and 54 months of ages as compared to other studies in which children's emotion perception variables were assessed among school-aged children (e.g., Fine et. al., 2004). It is possible that maladaptive information processing is not formed before school age when children's use of language, memory strategies and other cognitive processes increases.

In the current study, the two components of emotion understanding, EPA and EPB, were separately evaluated as predictors of children's disruptive behaviors to examine whether these two constructs differentially related to outcomes. Furthermore, this study was among few that tested for the longitudinal contributions of parenting and child characteristics to EPA and EPB. Although the hypothesized longitudinal relations were not supported, an interesting finding emerged regarding the association of language and emotion perception accuracy. Children's later expressive language was predicted by children's earlier emotion perception accuracy. Currently there are few intervention programs that have been designed to improve children's emotion understanding (e.g., Promoting

Alternative Thinking Strategies; PATHS) with the premise to increase children's social and academic competence. The bidirectional relation between emotion perception accuracy and language in the current study brings additional evidence for the important role of emotion understanding in children's language development and academic achievement, and for the significance of implementation of intervention programs that are designed to improve children's emotion knowledge. Given that no significant relations was found for the hypothesized relations, no conclusion can be made from this study regarding the necessity of distinguishing between EPA and EPB as two separate components of emotion understanding. As discussed earlier, lack of findings may be due to various reasons including the limitations of sample and measures used in this study, and/or the age of participating children. Thus, rejecting previous research findings regarding the contributions of children's negative emotionality and negative parenting practices to children's maladaptive information processing cannot be rejected based on the results of the current study. The hypotheses of this study should be examined using more diverse sample -- in terms of family SES, participants' race/ethnicity, other environmental factors, and children's age - - to be able to make conclusions about the inevitability of distinguishing between two components of emotion understanding.

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Footnotes

¹ In addition to testing the longitudinal hypothesized relations for boys and girls separately, separate regression analyses were conducted to test for the moderating effects of sex on the observed significant associations of parenting and children's negative emotionality to emotion perception variables. Only the result of one out of six moderation analyses was significant. Sex moderated the relation between T2 mothers' negative-dominant expressivity and T3 sad perception bias. For boys only, high levels of mothers' negative-dominant expressivity at T2 were related to high sad bias.

² The models were conducted using both continuous and categorical bias variables. The models could not be run using the maximum likelihood estimation because the within-time covariances between predictors and categorical perception bias variables were not identified. In order to obtain the within-time covariances between parenting/negative emotionality and the categorical variables, latent response factors were created to be linked to the categorical variables. However the number of integration points was high and the models could not be run. The alternative to using the ML or MLR estimation was to use the weighted least squares with missing data (WLSMV) estimation. Although WLSMV can appropriately handle missing data and has been suggested to be used when testing the non-linear SEM models with categorical variables, the data used in the current

study was not likely to have met missing data requirements for running SEM models using WLSMV (Asparouhov & Muthen, 2010).

APPENDIX A
MEASURES

Parents' expressivity

Self-Expressiveness in the Family Questionnaire (SEFQ)

Administered to mothers and fathers at 24, 36 and 48 months.

Directions. This is a questionnaire about your expressiveness. Try to think how frequently you express yourself when these situations occur with family members.

If you never or rarely express those feelings, select a 1, 2, or 3. If you express those feelings with some or moderate frequency, select a 4, 5, or 6. And if you express those feelings very frequently select a 7, 8, or 9. There is no right or wrong answers and we don't believe that any answer is better than another.

Negative Dominant Scale

1. Showing contempt for another's action.
2. Expressing dissatisfaction with someone else's behavior.
3. Expressing anger at someone else's carelessness.
4. Blaming one another for family troubles.
5. Putting down other people's interest.
6. Showing dislike for someone.
7. Quarreling with a family member.
8. Expressing momentary anger over a trivial irritation.
9. Threatening someone.
10. Criticizing someone for being late.

Negative Submissive Scale

1. Sulking over unfair treatment by a family member.
2. Crying after an unpleasant disagreement.

3. Expressing embarrassment over a stupid mistake.
4. Going to pieces when tension builds up.
5. Expressing disappointment over something that didn't work out.
6. Showing how upset you are after a bad day.
7. Expressing sorrow when a pet dies.
8. Crying when a loved one goes away.
9. Apologizing for being late.
10. Telling a family member how hurt you are.

Parents' Non-Supportive Reactions

Coping with Toddlers' negative Emotion Scale (CTNES)

Administered to mothers at 30 and 42 months.

Directions: For the following items, please indicate the likelihood that you would respond in the ways listed for each item. Please read each item carefully and respond as honestly and sincerely as you can. For each question, please fill in a circle for each item (a-g).

1. If my child becomes angry because he wants to play outside and cannot do so because he is sick, I would:
 - a. Feel upset myself
 - b. Tell my child we will not get to do something else fun (i.e., watch t.v., play, games) unless he stops behaving like
 - c. Tell my child it's ok to be angry
 - d. Soothe my child and/or do something with him to make him feel better
 - e. Help my child find something he wants to do inside.
 - f. Tell my child that he is making a big deal out of nothing
 - g. Let my child play outside

2. If my toddler spilled something and made a big mess on the carpet, and then gets upset and cries, I would:
 - a. Comfort my child by picking him up and/or trying to get him to forget about the accident
 - b. Tell my child that he is overreacting or making a big deal out of nothing
 - c. Remain calm and not let myself get upset

- d. Send my child to his room for making a mess
 - e. Help my child find a way to clean up the mess
 - f. Tell my child that it is ok to be upset
3. If my child loses some prized possession (for example, favorite blanket or stuffed animal) and reacts with tears, I would:
- a. Go and buy my child a new item
 - b. Help my child think of other places to look for the toy
 - c. Distract my child with another toy to make him feel better
 - d. Tell my child that it is not that important
 - e. Tell my child it is his fault for not being careful with the toy
 - f. Feel upset myself
 - g. Tell my child it is okay to feel sad about the loss
4. If my child is afraid of going to the doctor or of getting shots and becomes quite shaky and teary, I would:
- a. Tell him to shape up or he won't be allowed to do something he likes to do (i.e., go to playground)
 - b. Tell my child that it is ok to be nervous or afraid
 - c. Tell my child that it's really no big deal
 - d. Comfort my child before and/or after the shot
 - e. Leave the doctor's office and reschedule for another time
 - f. Help him think of ways to make it less scary, like squeezing my hand when he gets a shot

g. Get nervous myself

5. If my child is going to spend the afternoon with a new babysitter and becomes nervous and upset because I am leaving him, I would:

a. Distract my child by playing and talking about all of the fun he will have with the sitter

b. Feel upset or uncomfortable because of my child's reactions

c. Tell my child that he won't get to do something else enjoyable (i.e., go to playground, get a special snack) if he doesn't stop behaving like that

d. Tell him that it's nothing to get upset about

e. Change my plans and decide not to leave my child with the sitter

f. Help my child think of things to do that will make it less stressful, like me calling him once during the evening

g. Tell my child that it's ok to be upset

6. If my child becomes upset and cries because he is left alone in his bedroom to go to sleep, I would:

a. Become upset myself

b. Tell my child that if he doesn't stop crying, we won't do something fun when he wakes up

c. Tell my child it's okay to cry when he is sad

d. Soothe my child with a hug or kiss

e. Help my child find ways to deal with my absence (hold a favorite stuffed

animal, turn on a nightlight, etc)

f. Stay with my child or take him out of the bedroom to be with me until he falls asleep

g. Tell him that there is nothing to be afraid of

7. If my child becomes angry because he is not allowed to have a snack (i.e., candy, ice cream) when he wants it, I would:

a. Send my child to his room

b. Give my child the snack that he wanted

c. Distract child by playing with other toys or games

d. Tell him that there is no reason to be upset

e. Tell my child it's okay to feel angry

f. Help my child think of something to eat that he is allowed to have between meals

g. Feel angry at my child's behavior

8. If my child becomes upset because I removed something that my child should have not been playing with, I would:

a. Tell my child that if he touches it again he will not be allowed to do something enjoyable

b. Help my child think of something else to do that is fun

c. Become upset myself

d. Tell my child it's okay to feel angry

e. Distract my child with something else interesting

- f. Give my child what he wants
 - g. Ignore my child's upset reactions and take the object away
9. If my child wants me to play with him and I cannot do so right then (i.e., I am on the phone, in the middle of a conversation with someone), and my child becomes upset, I would:
- a. Feel upset myself
 - b. Tell my child that there is nothing to be upset about
 - c. Help my child find something to do while he waits for me to play with him.
 - d. Tell my child I won't play with him later if he doesn't stop behaving like that
 - e. Tell my child it's okay to be upset
 - f. Stop what I'm doing so I can play with my child
 - g. Soothe my child and talk to him to make him feel better
10. If my child is playing with a puzzle or shape sorter toy and cannot fit a piece correctly, and gets upset and cries, I would:
- a. Remain calm and not let myself get anxious
 - b. Take the toy away from my child
 - c. Comfort my child with a pat or a kiss
 - d. Put the piece in for my child
 - e. Tell my child it's okay to get frustrated and upset
 - f. Help my child figure out how to put the piece in correctly

g. Tell my child it's nothing to cry about

11. If my child has climbed onto a piece of playground equipment and gets stuck,

and becomes nervous and begins to cry, I would:

a. Become anxious myself

b. Help my child figure out how to get down from the climber

c. Take my child down from the climber

d. Tell my child he shouldn't have gone up by himself.

e. Tell my child its nothing to get upset about

f. Comfort my child with words or a pat

g. Tell my child it's okay to be afraid

12. If my child fell down and scraped himself while trying to get a favorite toy, I

would:

a. Become upset myself

b. Help my child figure out how to feel better (getting a band-aid)

c. Distract my child with something else

d. Tell my child that he should be more careful

e. Tell my child its nothing to get upset about

f. Tell my child it's okay to cry

Distress reactions (DR). These items reflect the degree to which parents experience distress when children express negative affect.

Scoring: Mean of 1A, 2C*, 3F, 4G, 5B, 6A, 7G, 8C, 9A, 10A*, 11A, 12A

Punitive reactions (PR). These items reflect the degree to which parents respond with punitive reactions that decrease their exposure or need to deal with the negative emotions of their children.

Scoring: Mean of 1B, 2D, 3E, 4A, 5C, 6B, 7A, 8A, 9D, 10B, 11D, 12D

Minimization reactions (MR). These items reflect the degree to which parents minimize the seriousness of the situation or devalue the child's problem or distressful reaction.

Scoring: Mean of 1F, 2B, 3D, 4C, 5D, 6G, 7D, 8G, 9B, 10G, 11E, 12E

Note. * = reversed item

Coping with Children's negative Emotion Scale (CCNES)

Administered to mothers at 54 months.

Directions. The same as above.

1. If my child becomes angry because he/she is sick or hurt and can't go to his/her friend's birthday party, I would:
 - a. send my child to his/her room to cool off
 - b. get angry at my child
 - c. help my child think about ways that he/she can still be with friends (e.g., invite some friends over after the party)
 - d. tell my child not to make a big deal out of missing the party
 - e. encourage my child to express his/her feelings of anger and frustration
 - f. soothe my child and do something fun with him/her to make him/her feel better about missing the party

2. If my child falls off his/her bike and breaks it, and then gets upset and cries, I would:
 - a. remain calm and not let myself get anxious
 - b. comfort my child and try to get him/her to forget about the accident
 - c. tell my child that he/she is over-reacting
 - d. help my child figure out how to get the bike fixed
 - e. tell my child it's ok to cry
 - f. tell my child to stop crying or he/she won't be allowed to ride his/her bike anytime soon

3. If my child loses some prized possession and reacts with tears, I would:

- a. get upset with him/her for being so careless and then crying about it
 - b. tell my child that he/she is over-reacting
 - c. help my child think of places he/she hasn't looked yet
 - d. distract my child by talking about happy things
 - e. tell him/her it's ok to cry when you feel unhappy
 - f. tell him/her that's what happens when you're not careful
4. If my child is afraid of injections and becomes quite shaky and teary while waiting for his/her turn to get a shot, I would:
- a. tell him/her to shape up or he/she won't be allowed to do something he/she likes to do (e.g., watch TV)
 - b. encourage my child to talk about his/her fears
 - c. tell my child not to make big deal of the shot
 - d. tell him/her not to embarrass us by crying
 - e. comfort him/her before and after the shot
 - f. talk to my child about ways to make it hurt less (such as relaxing so it won't hurt or taking deep breaths)
5. If my child is going over to spend the afternoon at a friend's house and becomes nervous and upset because I can't stay there with him/her, I would:
- a. distract my child by talking about all the fun he/she will have with his/her friend
 - b. help my child think of things that he/she could do so that being at the friend's house without me wasn't scary (e.g., take a favorite book or toy with him/her)

- c. tell my child to quit over-reacting and being a baby
 - d. tell the child that if he/she doesn't stop that he/she won't be allowed to go out anymore
 - e. feel upset and uncomfortable because of my child's reactions
 - f. encourage my child to talk about his/her nervous feelings
6. If my child is participating in some group activity with his/her friends and proceeds to make a mistake and then looks embarrassed and on the verge of tears, I would:
- a. comfort my child and try to make him/her feel better
 - b. tell my child that he/she is over-reacting
 - c. feel uncomfortable and embarrassed myself
 - d. tell my child to straighten up or we'll go home right away
 - e. encourage my child to talk about his/her feelings of embarrassment
 - f. tell my child that I'll help him/her practice so that he/she can do better next time
7. If my child is about to appear in a recital or sports activity and becomes visibly nervous about people watching him/her, I would:
- a. help my child think of things that he/she could do to get ready for his/her turn (e.g., to do some warm-ups and not to look at the audience)
 - b. suggest that my child think about something relaxing so that his/her nervousness will go away
 - c. remain calm and not get nervous myself
 - d. tell my child that he/she is being a baby about it

- e. tell my child that if he/she doesn't calm down, we'll have to leave and go home right away
 - f. encourage my child to talk about his/her nervous feelings
8. If my child receives an undesirable birthday gift from a friend and looks obviously disappointed, even annoyed, after opening it in the presence of the friend, I would:
- a. encourage my child to express his/her disappointed feelings
 - b. tell my child that the present can be exchanged for something the child wants
 - c. NOT be annoyed with my child for being rude
 - d. tell my child that he/she is over-reacting
 - e. scold my child for being insensitive to the friend's feelings
 - f. try to get my child to feel better by doing something fun
9. If my child is panicky and can't go to sleep after watching a scary TV show, I would:
- a. encourage my child to talk about what scared him/her
 - b. get upset with him/her for being silly
 - c. tell my child that he/she is over-reacting
 - d. help my child think of something to do so that he/she can get to sleep (e.g., take a toy to bed, leave the lights on)
 - e. tell him/her to go to bed or he/she won't be allowed to watch any more TV
 - f. do something fun with my child to help him/her forget about what scared

him/her

10. If my child is at a park and appears on the verge of tears because the other children are mean to him/her and won't let him/her play with them, I would:
- a. NOT get upset myself
 - b. tell my child that if he/she starts crying then we'll have to go home right away
 - c. tell my child it's ok to cry when he/she feels bad
 - d. comfort my child and try to get him/her to think about something happy
 - e. help my child think of something else to do
 - f. tell my child that he/she will feel better soon
11. If my child is playing with other children and one of them calls him/her names, and my child then begins to tremble and become tearful, I would:
- a. tell my child not to make a big deal out of it
 - b. feel upset myself
 - c. tell my child to behave or we'll have to go home right away
 - d. help my child think of constructive things to do when other children tease him/her (e.g., find other things to do)
 - e. comfort him/her and play a game to take his/her mind off the upsetting event
 - f. encourage him/her to talk about how it hurts to be teased
12. If my child is shy and scared around strangers and consistently becomes teary and wants to stay in his/her bedroom whenever family friends come to visit, I would:

- a. help my child think of things to do that would make meeting my friends less scary (e.g., to take a favorite toy with him/her when meeting my friends)
- b. tell my child that it is OK to feel nervous
- c. try to make my child happy by talking about the fun things we can do with our friends
- d. feel upset and uncomfortable because of my child's reactions
- e. tell my child that he/she must stay in the living room and visit with our friends
- f. tell my child that he/she is being a baby

Distress reactions (DR). These items reflect the degree to which parents experience distress when children express negative affect.

Scoring: Mean of 1B, 2A*, 3A, 4D, 5E, 6C, 7C*, 8C*, 9B, 10A*, 11B, 12D.

Punitive reactions (PR). These items reflect the degree to which parents respond with punitive reactions that decrease their exposure or need to deal with the negative emotions of their children.

Scoring: Mean of 1A, 2F, 3F, 4A, 5D, 6D, 7E, 8E, 9E, 10B, 11C, 12E.

Minimization reactions (MR). These items reflect the degree to which parents minimize the seriousness of the situation or devalue the child's problem or distressful reaction.

Scoring: Mean of 1D, 2C, 3B, 4C, 5C, 6B, 7D, 8D, 9C, 10F, 11A, 12F.

Note. * = reversed item

Expressive Language

Macarthur Communicative development Inventory (Macarthur CDI) _Short Form Vocabulary Checklist_ Level II-Form A

Administered to mothers at 30 and 42 months

Directions. Children understand many more words than they say. We are particularly interested in the words your child SAYS. Please mark the words you have heard your child use. If your child uses a different pronunciation of a word, please mark it anyway. Please indicate if your child says the word in English, Spanish, or both.

- | | | |
|----------------|-------------|---------------|
| 1. baa baa | 29. sock | 57. hi |
| 2. meow | 30. chin | 58. no |
| 3. ouch | 31. car | 59. shopping |
| 4. uh oh | 32. hand | 60. thank you |
| 5. woof woof | 33. leg | 61. carry |
| 6. bear | 34. broom | 62. chase |
| 7. bird | 35. comb | 63. dump |
| 8. cat | 36. mop | 64. finish |
| 9. dog | 37. plate | 65. fit |
| 10. duck | 38. trash | 66. hug |
| 11. horse | 39. tray | 67. listen |
| 12. airplane | 40. towel | 68. like |
| 13. boat | 41. bed | 69. pretend |
| 14. car | 42. bedroom | 70. rip |
| 15. ball | 43. bench | 71. shake |
| 16. book | 44. oven | 72. taste |
| 17. game | 45. stairs | 73. gentle |
| 18. applesauce | 46. flag | 74. think |
| 19. candy | 47. rain | 75. wish |
| 20. coke | 48. star | 76. all gone |
| 21. cracker | 49. swing | 77. cold |
| 22. juice | 50. school | 78. fast |
| 23. meat | 51. sky | 79. happy |
| 24. milk | 52. party | 80. hot |
| 25. peas | 53. friend | 81. last |
| 26. hat | 54. mommy | 82. tiny |
| 27. necklace | 55. person | 83. wet |
| 28. shoe | 56. bye | 84. after |

85. day
86. tonight
87. our
88. them
89. this
90. us

91. where
92. beside
93. down
94. under
95. all
96. much

97. could
98. need
99. would
100. if

101. Has your child begun to combine words yet , such as “ ‘nother cookie” or
“doggie bite”?

1=Not yet

2=Sometimes

3= Often

Wechsler Preschool and Primary Scale of Intelligence (Wppsi)

Administered at 54 months.

Note. Scaled scores were computed according to the WPPSI manual, for chronological ages (at date of testing/lab visit) of 1) 4 years, 3 months, 0 days – 4 years, 5 months, 30 days, or 2) 4 years, 6 months, 0 days – 4 years, 8 months, 30 days, or (for one subject only) 3) 4 years, 9 months, 0 days – 4 years, 11 months, 30 days (for the subject at this age range (#115), the scaled scores for that subject's raw scores were the same as if they were scaled at the next youngest age).

Expressive (Vocabulary) scale:

25 items (5 picture + 20 verbal; began testing at verbal items)

Total raw score range: 0 – 43

Total scale score range: 1 – 19

Receptive Vocabulary scale:

38 items (began testing at item 6)

Total raw score range: 0 - 38

Total scale score range: 1 - 19

Emotion Perception

Administered to children at 30, 42 and 54 months.

Puppet Show: Situation 1 (stereotypical)

Administered at 30, 42 and 54 months.

sibs **1. HAPPY:**

Hi! I'm Nancy/Johnny. Here is my brother/sister. Ah! S/he gave me some ice cream. YUM, YUM!!

sibs **2. SAD:**

We are walking home.

SIB: I am going to push you down!!

Ow!! It hurts!! OWW!!

sibs **3. MAD:**

I just finished building this tower, and I feel really good about it. Doesn't it look good?

SIB: No! I think it looks yucky. I'm going to knock it down!

CRASH!!

child **4. SCARED:**

Shhh!! Nancy/Johnny is asleep.

Ooh, I am dreaming. There is a tiger chasing after me!! OH NO!!

child **5. HAPPY:**

mom *Here comes Mommy. Mommy is going to take me to the zoo.*

MOM: Come on, Nancy/Johnny. Let's go see the animals.

Oh, I love the elephants. Here we go! Bye, bye!

child **6. SAD:**

I am going to go ride my bike. Where is it? Someone took it! It's gone!

Someone stole it!

child **7. SCARED:**

Nancy/Johnny is all alone.

It's really dark in here. There's no one around. OOOOhhh.

child **8. MAD:**

mom *I don't like to eat cabbage!*

MOM: *You have to eat it, and that's that!*

Ugh! No! No!

Children's Dispositional Negative Emotionality

Early Childhood Behavior Questionnaire (ECBQ)

Administered to mothers and caregivers at 30, 42 and 54 months.

ECBQ: Frustration

When told that it is time for bed or a nap, how often did your child:

1. react with anger?
2. get irritable?

While having trouble completing a task (e.g., building, drawing, dressing), how often did your child:

3. get easily irritated?

When s/he couldn't find something to play with, how often did your child:

4. get angry?

When another child took away his/her favorite toy, how often did your child:

5. scream with anger?
6. not become angry? REVERSED

When given something to eat that s/he didn't like, how often did your child:

7. become angry?

When s/he asked for something and you said "no", how often did your child:

8. become frustrated?
9. protest with anger?
10. have a temper tantrum?

When tired after a long day of activities, how often did your child:

11. become easily frustrated?

When you mildly criticized or corrected her/his behavior, how often did your child:

12. get mad?

ECBQ: Fear

During everyday activities, how often did your child:

1. startle at loud noises (such as a fire engine siren)?
2. seem frightened for no apparent reason?

While at home, how often did your child:

3. show fear at a loud sound (blender, vacuum cleaner, etc.)?
4. seem afraid of the dark?

While watching TV or hearing a story, how often did your child:

5. seem frightened by 'monster' characters?

While in a public place, how often did your child:

6. seem uneasy about approaching an elevator or escalator?
7. cry or show distress when approached by an unfamiliar animal?
8. seem afraid of large, noisy vehicles?
9. show fear when the caregiver stepped out of sight?

When visiting a new place, how often did your child:

10. not want to enter?
11. go right in? REVERSED

ECBQ: Sadness

While having trouble completing a task (e.g., building/drawing/dressing), how often did your child:

1. become sad?

During everyday activities, how often did your child:

2. become sad or blue for no apparent reason?

When another child took away his/her favorite toy, how often did your child:

3. sadly cry?
4. not react with sadness? REVERSED

When told “no”, how often did your child:

1. become sadly tearful?

Following an exciting activity or event, how often did your child:

2. seem to feel down or blue?
3. become sadly tearful?

When s/he asks for something, and you say, “no”, how often did your child:

4. become sad?

When asked to wait for a desirable item (such as ice cream or a treat), how often did your child:

5. whimper and cry?

When you removed something s/he should not have been playing with, how often did your child:

6. become sad?

When you mildly criticized or corrected her/his behavior, how often did your child:

7. have hurt feelings?

When your child was asked to share his/her toys, how often did your child:

8. become sad?

Earlier Aggressive Behaviors
Infant-Toddler Social and Emotional Assessment (ITSEA)
Aggression

Defiance

1. is obedient or defiant. For example, refuses to do as you ask.
2. Is stubborn.
3. Has temper tantrums.

Relational Defiance

1. Acts bossy
2. Misbehaves to get attention from adults
3. Is sneaky. Hides misbehavior

Dispositional Aggression

1. Acts aggressive when frustrated.
2. Hurts animals on purpose
3. Swears.

Oppositional /Defiant Aggression

1. Is destructive. Breaks or ruins things on purpose.
2. Hits, bites, or kicks you (or other parent).
3. Purposely tries to hurt you (or other parent).

Peer Aggression

Relational Aggression

1. Won't let other children play with his/her group
2. Teases other children.
3. "Tests" other children to see if they will get angry.

Overt Aggression

1. Picks on or bullies other children.
2. Hurts other children on purpose.
3. Hits, shoves, kicks, or bites other children.

APPENDIX B

TABLES

Table 1

Data Collection: Time Points and Measures

Measures	Time points						
	T2		T3		T4		T5
	24	30	36	42	48	54	72
Mothers' Expressivity	X		X		X		
Mothers' Reactions		X		X		X	
Children's Emotionality		X		X		X	
EPA/EPB		X		X		X	
Disruptive Behaviors							X
Earlier Aggressive Behaviors		X		X		X	
Expressive Language		X		X		X	

Note. EPA = Emotion Perception Accuracy; EPB = Emotion Perception Bias

Table 2

Correlations Among Study Variables at Time 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Negative-Dominant	----	.45**	.19**	.12	.07	.32**	.18**	.09	.03	-.01	-.07	.10	.04	.09	.09
2. Negative-Dominant		----	.14*	.19**	-.01	.15*	.20**	.14	-.22*	-.10	-.08	.13	.08	.12	.13 [†]
3. Punitive Reactions			----	.24**	.52**	.30**	.24**	.11	.18*	.11	.15	-.03	-.06	-.05	-.05
4. Distress Reactions				----	.15*	.17*	.14*	.09	.14	.12	.15	.11	-.05	-.05	.00
5. Minimizing Reactions					----	.08	.10	.07	.10	.13	.10	.00	-.13	-.07	-.09
6. M_Anger						----	.52**	.33**	.25**	.19*	.16	-.04	.00	.06	.01
7. M_Sadness							----	.32**	.07	.14	.06	.05	.05	.05	.06
8. M_Fear								----	.06	.10	.24**	-.09	-.05	.04	-.05
9. C_Anger									----	.58**	.07	-.07	-.15	-.04	-.11
10. C_Sadness										----	.50**	.00	.04	-.14	-.03
11. C_Fear											----	-.04	-.04	-.06	-.06
12. Anger_A												----	.50**	.46**	.82**
13. Sad_A													----	.40**	.83**
14. Fear_A														----	.74**
15. EPA															----

Notes. [†] $p < .10$, * $p < .05$, ** $p < .01$; n range was 225 to 115; M = Mother; C = Caregiver; EPA = Emotion perception accuracy; A= Accuracy; correlations between study variables and bias variables are noted in the text.

Table 3

Correlations among Study variables at T3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Negative-Dominant	---	.48**	.17*	.14	.12	.20**	.08	.10	.16	.12	-.10	-.07	-.15*	-.02	-.09
2. Negative-Submissive		----	.15*	.17*	.16*	.25**	.23**	.11	.09	.15	-.13	.10	-.01	.05	.02
3. Punitive Reactions			---	.25**	.57**	.33**	.25**	.19*	.21*	.19*	.04	-.25**	-.23**	.06	-.22**
4. Distress Reactions				----	.09	.27**	.15*	.17*	.27**	.25**	.17*	-.14*	-.11	-.08	-.13
5. Minimizing Reactions					----	.08	.10	.07	.10	.10	.13	.00	-.13	-.07	-.16*
6. M_Anger						----	.59**	.30**	.40**	.20*	.07	-.07	-.13	-.02	-.09
7. M_Sadness							----	.36**	.20*	.21*	.14	.01	-.09	-.03	-.04
8. M_Fear								----	-.01	.12	.35**	-.09	-.07	.00	-.06
9. C_Anger									----	.60**	.17*	-.10	-.03	.08	-.02
10. C_Sadness										----	.35**	-.04	.03	.07	.02
11. C_Fear											----	.07	.05	-.03	-.02
12. Anger_A												----	.60**	.53**	.86**
13. Sad_A													----	.47**	.83**
14. Fear_A														----	.81**
15. EPA															----

Notes. * $p < .05$, ** $p < .01$; n range was 219 to 139; M = Mother; C = Caregiver; EPA = Emotion perception accuracy; A= Accuracy; correlations between study variables and bias variables are noted in the text.

Table 4

Correlations Among Study Variables at Time 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Negative-Dominant	---	.54**	.20*	.27**	.22**	.17*	.13	.09	.11	.02	.08	.08	.05	-.09	.00
2. Negative-Submissive		---	.16*	.30**	.05	.17*	.24**	.20**	.09	.15	.22**	.06	.01	-.12	-.03
3. Punitive Reactions			---	.44**	.70**	.20**	.19*	.19*	.13	.10	.01	-.19*	-.17*	-.10	-.17*
4. Distress Reactions				---	.31**	.25**	.18*	.07	.15	.08	.03	-.04	.07	.04	.03
5. Minimizing Reactions					---	.16*	.22**	.17*	.09	.10	-.14	-.11	-.03	-.02	-.06
6. M_ Anger						---	.52**	.26**	.35**	.15	.02	-.04	-.07	-.09	-.03
7. M_ Sadness							---	.35**	.06	.22**	.04	.03	-.01	-.03	-.05
8. M_ Fear								---	-.06	.06	.18*	-.07	-.06	-.01	-.01
9. C_ Anger									---	.62**	.24**	-.18*	-.12	-.08	-.14
10. C_ Sadness										---	.43**	-.20*	-.10	-.03	-.12
11. C_ Fear											---	-.28**	-.17	-.08	-.19*
12. Anger_A												---	.68**	.44**	.79**
13. Sad_A													---	.75**	.93**
14. Fear_A														---	.87**
15. EPA															---

Notes. * $p < .05$, ** $p < .01$; n range was 194 to 120; M = Mother; C = Caregiver; EPA = Emotion perception accuracy; A = Accuracy; correlations between study variables and bias variables are noted in the text.

Table 5

Means and Standard Deviations of Study Variables

Study Variables	T2		T3		T4		T5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Negative-dominant	3.61*	.07	3.76*	.08	3.61*	.08	N/A	N/A
Negative-submissive	5.10	.08	5.19	.08	4.95 [†]	.09	N/A	N/A
Distress reaction	3.09	.07	3.07	.07	2.83	.06	N/A	N/A
Punitive reactions	2.50	.06	2.82	.06	2.35	.06	N/A	N/A
Minimizing reactions	3.17	.07	3.32	.07	2.47	.06	N/A	N/A
Negative reactions	2.92	.72	3.07	.70	2.55	.59	N/A	N/A
M - Child's anger	3.75	.87	4.78	.05	4.66	.06	N/A	N/A
M - Child's sadness	3.18	.84	3.84**	.05	3.90**	.06	N/A	N/A
M - Child's fear	2.60	.84	3.79	.06	3.89	.07	N/A	N/A
C - Child's anger	3.02	.96	4.47	.08	4.22	.09	N/A	N/A
C - Child's sadness	2.81	.82	3.77	.06	3.78	.06	N/A	N/A
C - Child's fear	2.18	.81	3.82	.06	3.85	.03	N/A	N/A
A-Child's anger	3.52	.82	4.67	.70	4.46	.78	N/A	N/A
A-Child's sadness	3.07	.73	3.82**	.62	3.85**	.63	N/A	N/A
A-Child's fear	2.49	.77	3.79	.74	3.88	.71	N/A	N/A
Happy accuracy	.18	.01	.51	.03	.81 [†]	.02	N/A	N/A
Sad accuracy	.14*	.02	.51*	.03	.73	.02	N/A	N/A
Mad Accuracy	.11 [†]	.02	.56	.03	.80	.02	N/A	N/A
Fear Accuracy	.08 [†]	.01	.54	.03	.71	.03	N/A	N/A
Overall EPA	.12*	.19	.53	.32	.76	.26	N/A	N/A
Anger bias	.21	.02	.16 [†]	.28	.13	.34	N/A	N/A
Sad Bias	.17*	.02	.25	.35	.41	.49	N/A	N/A
Fear Bias	.18	.01	.11	.31	.04	.20	N/A	N/A
Expressive Language	72.88*	1.55	36.41	.72	11.34*	3.44	N/A	N/A
M - conduct disorder	N/A	N/A	N/A	N/A	N/A	N/A	1.28	.13
T - conduct disorder	N/A	N/A	N/A	N/A	N/A	N/A	.77	.16

Notes. [†] $p < .10$, * $p < .05$, ** $p < .01$ for sex differences; n range was 116 to 136 for boys and 93 to 110 for girls; $N_s = 225-148$ at T2, 219-143 at T3, 194-168 at T4, 158-131 at T5; M = Mother-reported; C = Caregiver-reported; T = Teacher-reported; A= Aggregate score.

Table 6

Correlations of Predictors and Emotion Perception Accuracy across Time Points

	Time 3							Time 4						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Time 2														
1.Negative dominant	.62**	.30**	.11	.31**	.19**	.05	-.05	.68**	.23**	.19*	.16*	.04	.06	-.02
2. Negative submissive	.17**	.51**	.14	.20**	.27**	.12	.00	.31**	.61**	.15	.10	.25**	.19*	-.02
3. Negative reactions	.26**	.24**	.76**	.32**	.30**	.24**	-.26**	.17*	.22**	.55**	.29**	.24**	.15	-.10
4. Child's anger	.29**	.14*	.22**	.49**	.30**	.22**	-.01	.13	.00	.27**	.49**	.34**	.17*	-.03
5. Child's sadness	.19**	.12	.19**	.34**	.37**	.33**	.00	.07	.08	.15	.30**	.37**	.30**	-.04
6. Child's fear	.16*	.13	.20**	.17*	.30**	.53**	-.06	.09	.03	.19*	.22**	.33**	.53**	.02
7. EPA	-.02	.13	-.03	.10	.04	-.04	.29**	.22**	.19*	.07	-.05	.07	.01	.24**
Time 3														
1.Negative dominant								.62**	.22**	.19*	.22**	.12	.11	.01
2. Negative submissive								.38**	.63**	.15	.12	.16*	.10	.06
3.Negative reactions								.21**	.25**	.59**	.28*	.20**	.13	-.08
4. Child's anger								.17*	.17*	.18*	.55**	.30**	.14	-.04
5. Child's sadness								.14	.24*	.16*	.30**	.54**	.24**	.08
6. Child's fear								.09	.16*	.27**	.19**	.25**	.56**	-.01
7. EPA								.00	.02	-.25**	-.21**	-.07	-.03	.43**

Notes. * $p < .05$, ** $p < .01$; EPA= emotion perception accuracy; n range was to ; the correlations between study and emotion perception variables are noted in the text.

APPENDIX C

FIGURES

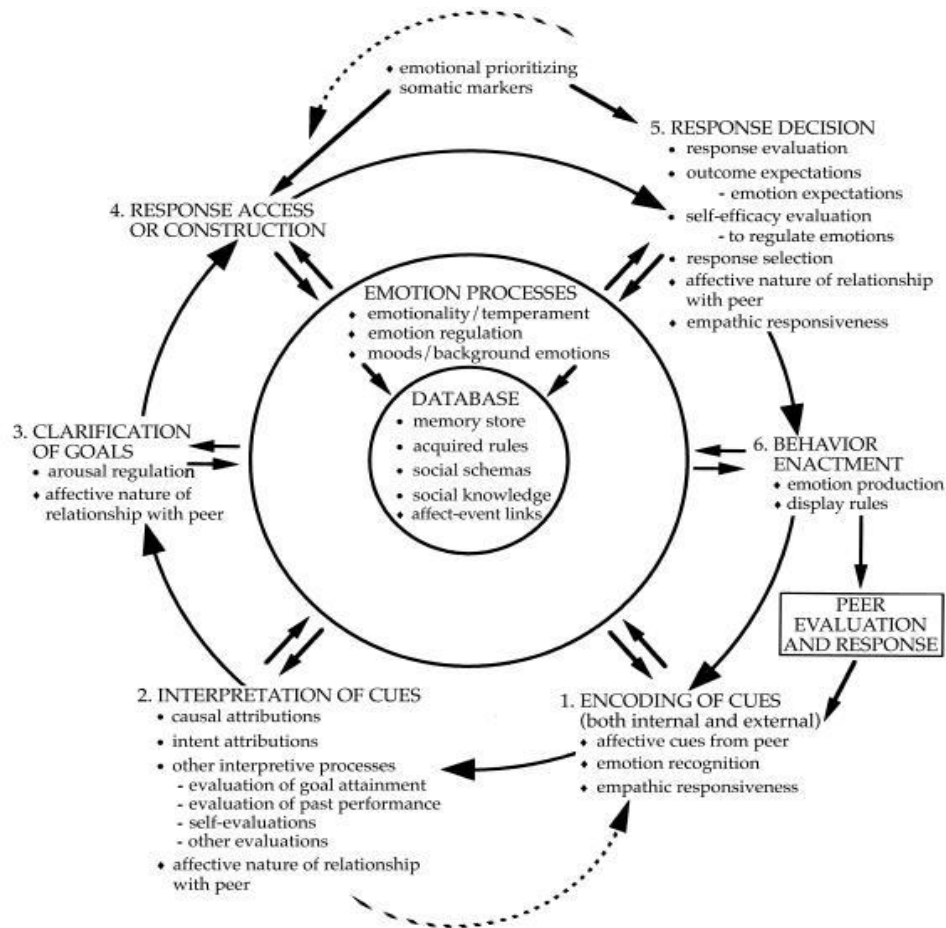


Figure 1. Lemerise and Arsenio's revised model

Notes: From "An integrated model of emotion processes and cognition in social information processing" by E. A. Lemerise & Arsenio W. F. (2000), *Child Development*, 71, 107-118; Those filled with diamonds and underlined are added in the new model, and those filled with circles are from the Dodge and Crick's original SIP model

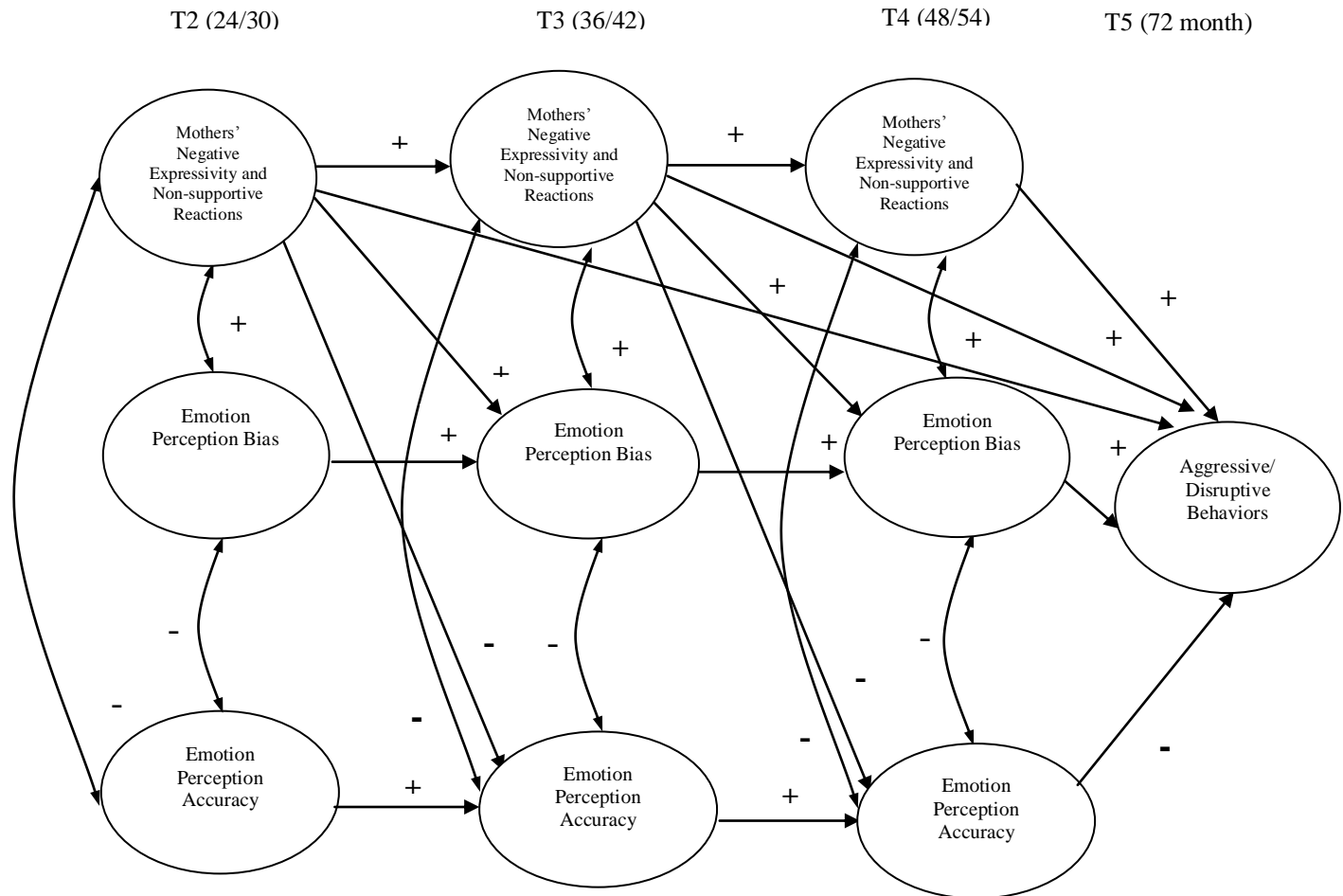


Figure 2. Hypothesized longitudinal relations of mothers' negative expressivity, non-supportive reactions to children's emotion perception accuracy, emotion perception bias and aggressive/disruptive behaviors.

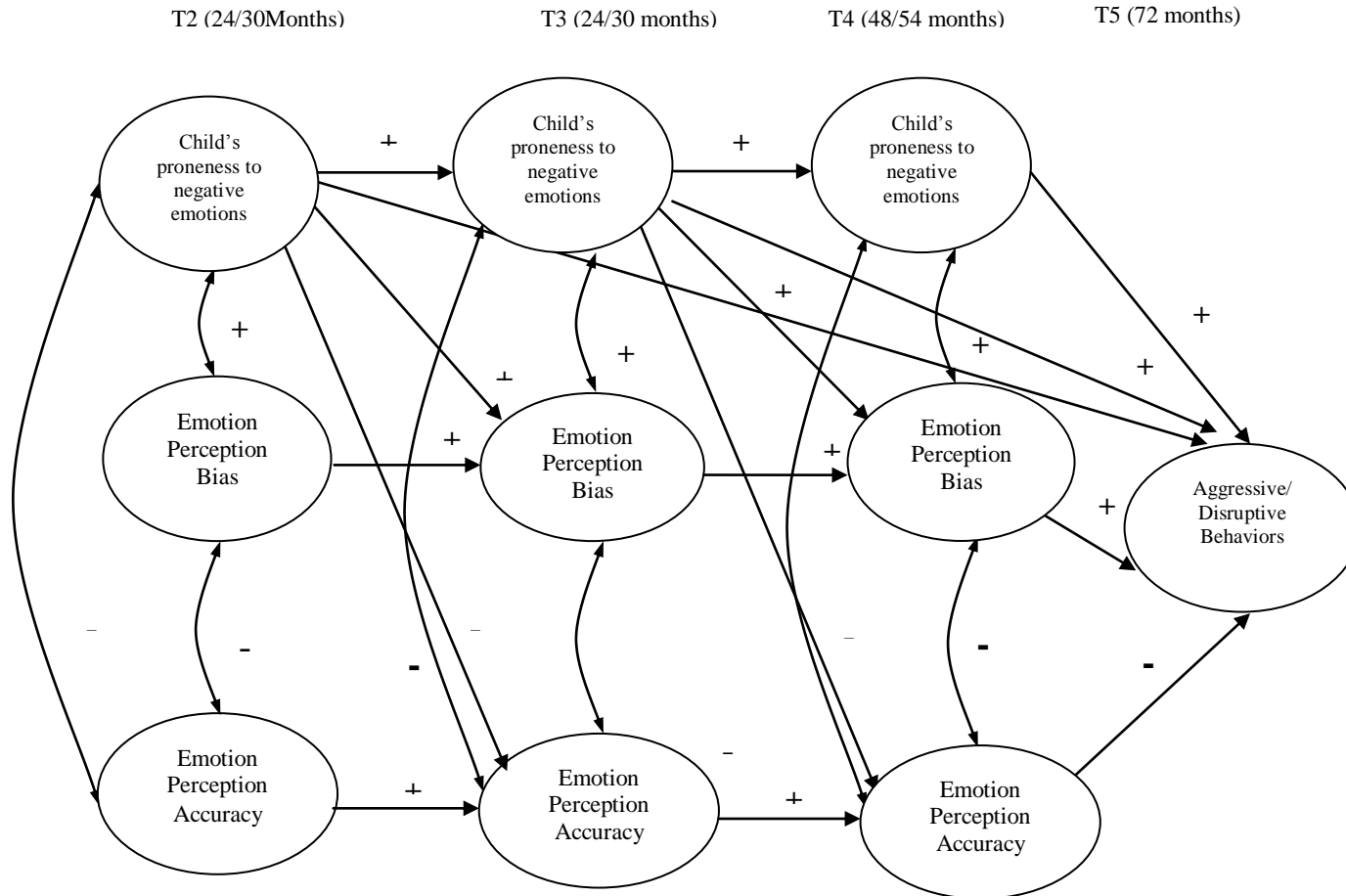


Figure 3. Hypothesized longitudinal relations of children' negative emotionality to children's emotion perception accuracy, emotion perception bias and aggressive/disruptive behaviors.

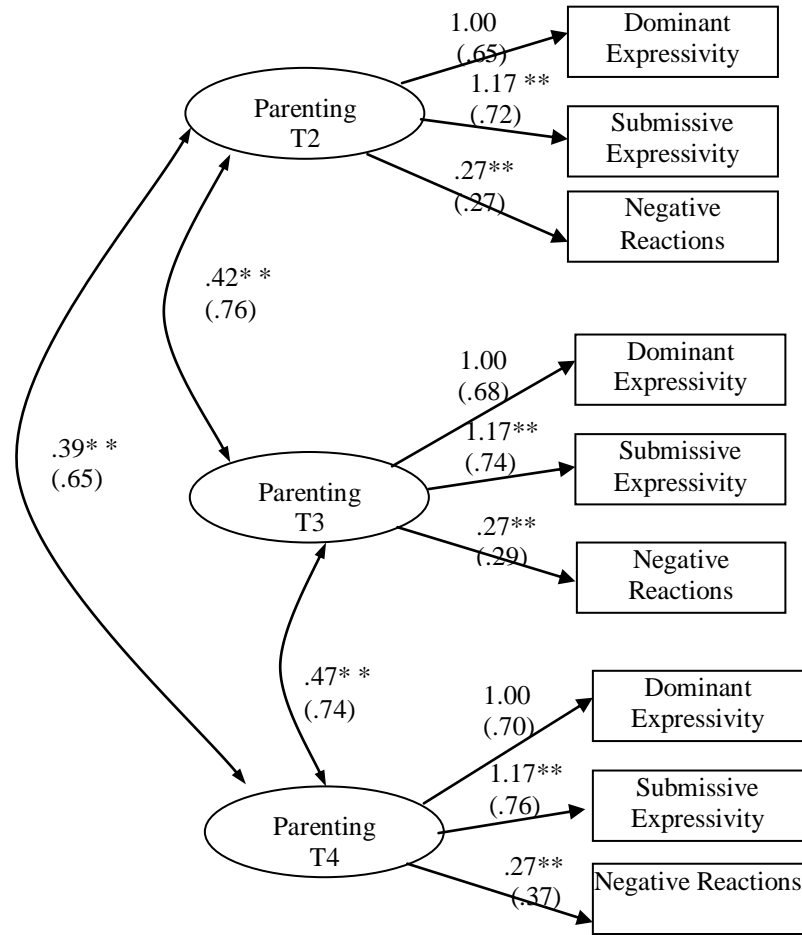


Figure 4. Longitudinal confirmatory factor analysis for parenting latent construct: final model with loadings and variances of indicators constrained; * $p < .05$, ** $p < .01$; Standardized parameter estimates are presented in parentheses.

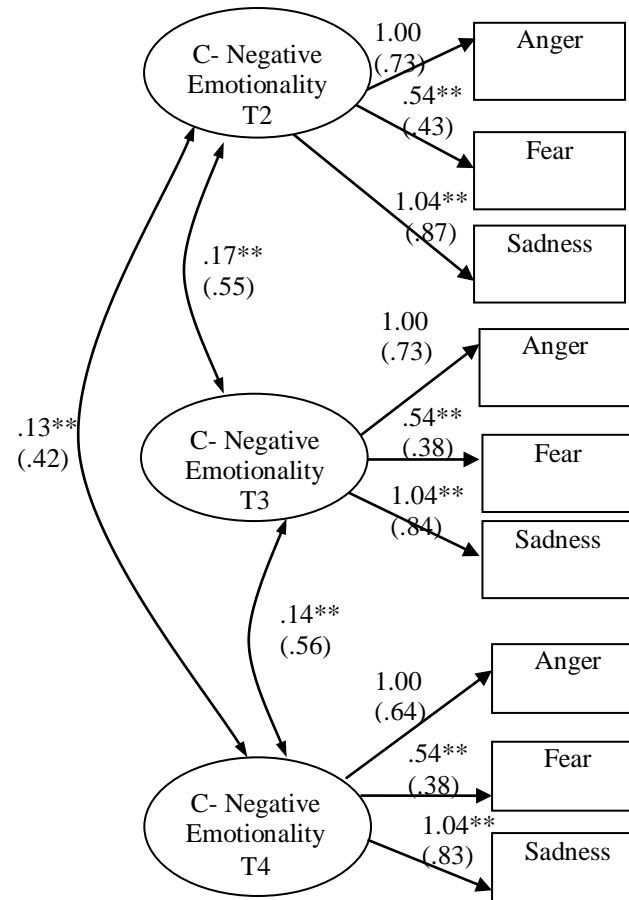


Figure 5. Longitudinal confirmatory factor analysis for children's negative emotionality latent construct: final model with loadings and variances of indicators constrained; * $p < .05$, ** $p < .01$; C = Child.

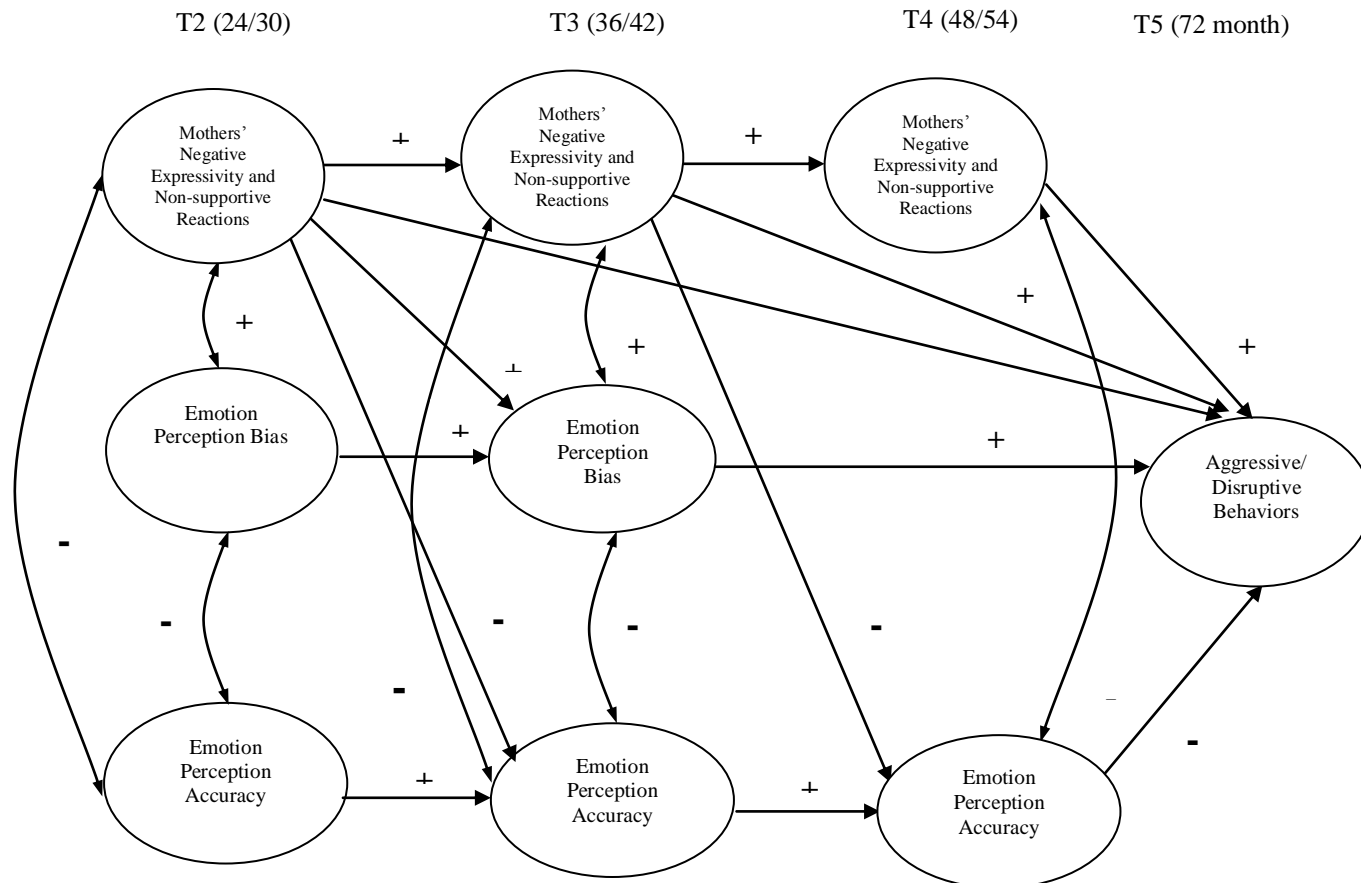


Figure 6. Revised longitudinal model of relations of mothers' negative expressivity, non-supportive reactions to children's emotion perception accuracy, emotion perception bias and aggressive/disruptive behaviors.

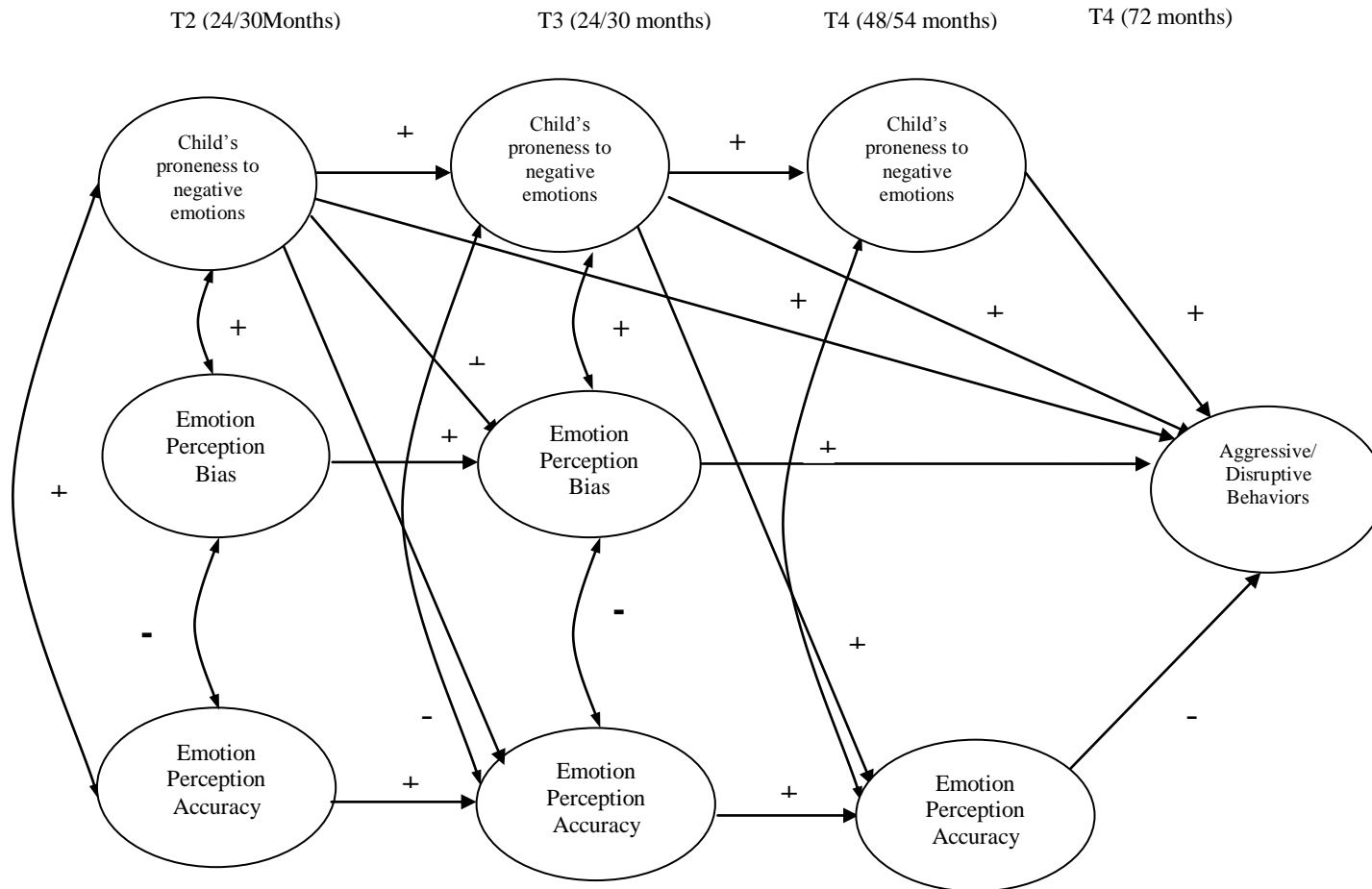


Figure 7. Revised longitudinal model of relations of children's negative emotionality to children's emotion perception accuracy, emotion perception bias and aggressive/disruptive behaviors.

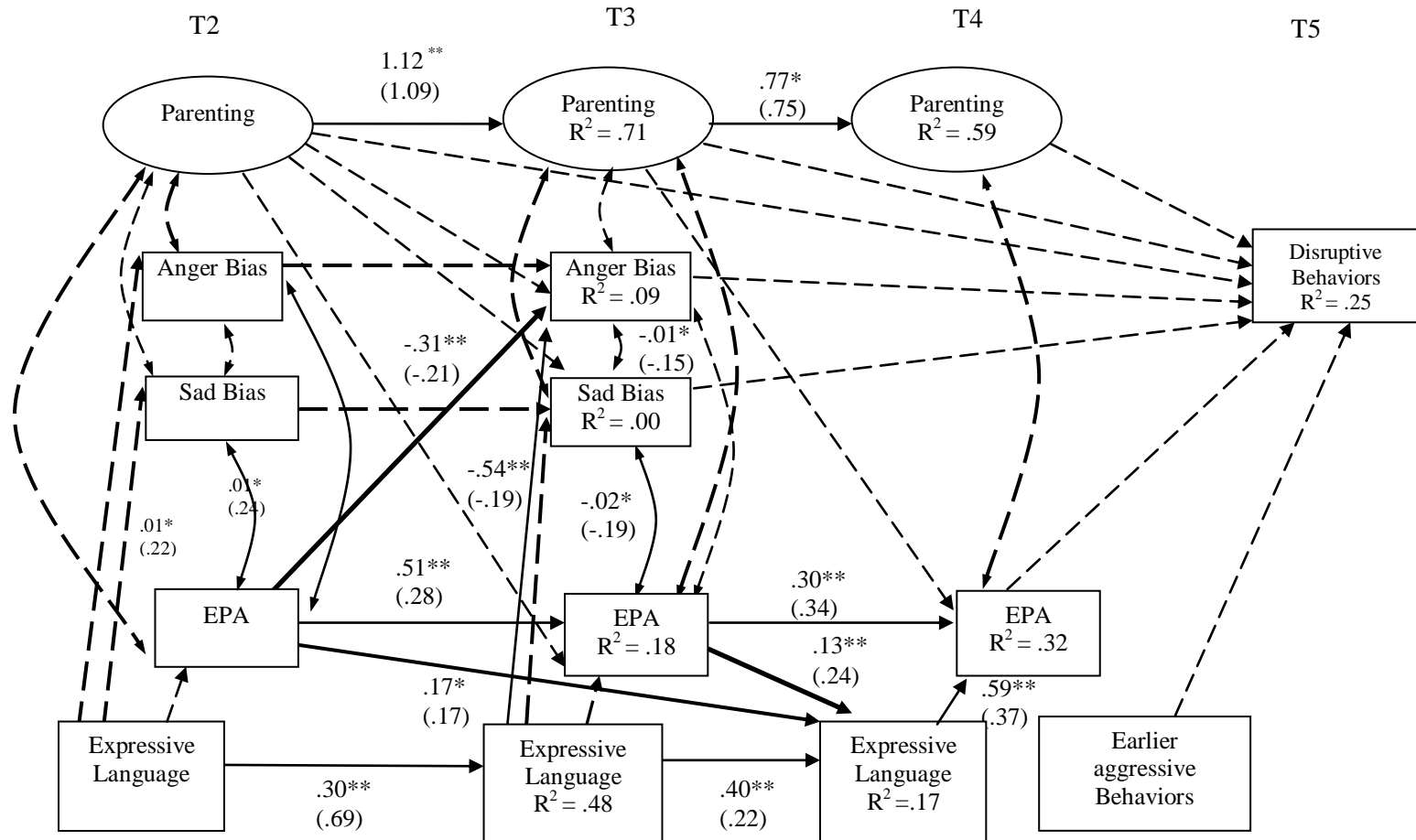


Figure 8. The mediating role of emotion perception variables in the relation between parenting and disruptive behaviors.
 Notes. $^{\dagger}p < .10$, $*p < .05$, $**p < .01$; Dashed lines represent non-significant relations, bold lines represents unspecified significant paths that were added to the model and bold dashed lines represents deleted non-significant paths; EPA= Emotion perception

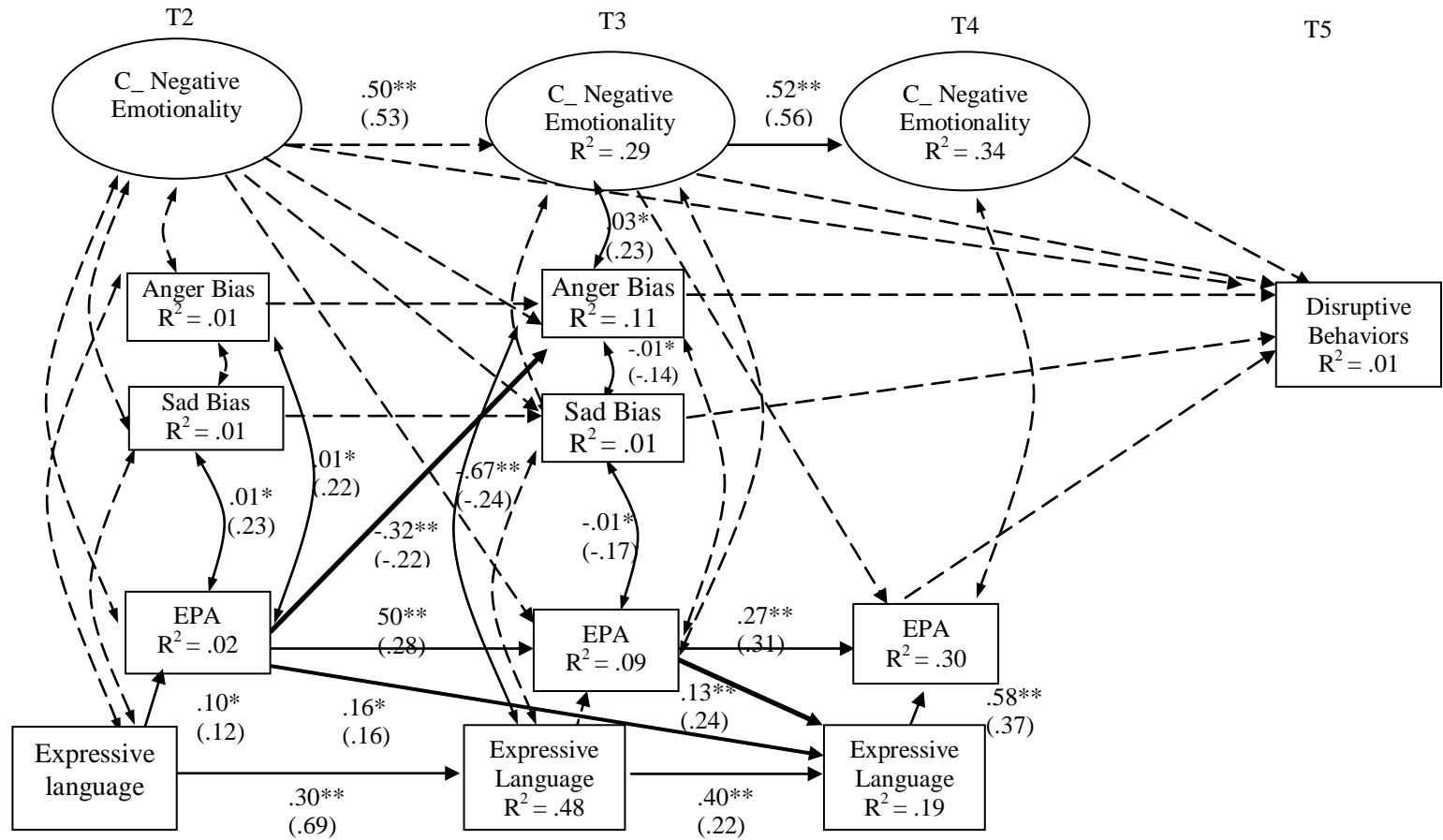


Figure 9. The mediating role of emotion perception variables in the relation between negative emotionality and disruptive behaviors. Notes. [†]*p* < .10, **p* < .05, ** *p* < .01; Dashed lines represent non-significant psths, bold lines represents unspecified significant paths added and bold dashed lines represents deleted non-significant paths; EPA= Emotion perception accuracy; C= Child.